# DEPARTMENT OF AGRICULTURE APPROPRIATIONS, 1953

MONDAY, MARCH 24, 1952

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
*Washington, D. C.*

The subcommittee met at 10:30 a. m., pursuant to recess, in room F-39, the Capitol, Hon. Richard B. Russell (chairman of the subcommittee) presiding.

Present: Senators Russell, Young, Ferguson, Cordon, McCarthy, and Thye.

## AGRICULTURAL RESEARCH ADMINISTRATION

### BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

**STATEMENT OF DR. A. H. MOSEMAN, CHIEF, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING (ACCOMPANIED BY DR. F. P. CULLINAN, ASSISTANT CHIEF, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING; DR. W. M. MYERS, DIRECTOR OF FIELD CROPS RESEARCH, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING; DR. F. W. PARKER, DIRECTOR OF SOILS RESEARCH, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING; DR. E. G. McKIBBEN, DIRECTOR OF AGRICULTURAL ENGINEERING RESEARCH, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING; V. H. BEACH, BUDGET OFFICER, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING; AND RALPH S. ROBERTS, DIRECTOR OF FINANCE AND BUDGET OFFICER, DEPARTMENT OF AGRICULTURE)**

BUDGET SCHEDULE

(Schedules from the justifications follow:)

*Salaries and expenses*

| | Plant soil, and agricultural engineering research | National Arboretum | Total |
|---|---|---|---|
| Appropriation Act, 1952 | $10,589,730 | $136,920 | $10,726,650 |
| Anticipated pay adjustment supplemental | 745,920 | 12,080 | 758,000 |
| Base for 1953 | 11,335,650 | 149,000 | 11,484,650 |
| Budget estimate, 1953 | 11,547,000 | 149,000 | 11,696,000 |
| Increase | +211,350 | | +211,350 |



96708—52——15

*Summary of increases and decreases, 1953*

| | |
|---|---|
| Plant, soil, and agricultural engineering research: | |
| To improve forage production in the South | +$33,000 |
| To develop methods for controlling halogeton and other noxious weeds | +40,000 |
| For soil surveys and soil management, irrigation and salinity investigations in reclamation areas | +125,000 |
| For fertilizer technology and evaluation investigations | +350,000 |
| Decrease due to partial absorption of pay adjustment costs | −61,650 |
| Elimination of nonrecurring item provided in the 1952 Appropriation Act for construction of a citrus laboratory at Orlando, Fla | −275,000 |
| Total | +211,350 |

*Project statement*

| Project | 1951 | 1952 (estimated) | Increase (+) or decrease (−) | | 1953 (estimated) |
|---|---|---|---|---|---|
| | | | Pay adjustment absorption | Other | |
| 1. PLANT, SOIL, AND AGRICULTURAL ENGINEERING RESEARCH | | | | | |
| (a) Field crop investigations | $3,329,688 | $3,565,000 | −$20,000 | $60,000 | $3,605,000 |
| (1) Cereal production, breeding, disease and quality investigations | (868,334) | (983,860) | (−5,520) | | (978,340) |
| (2) Cotton and other fiber plant production, breeding, disease, and quality investigations | (606,972) | (625,690) | (−3,800) | | (621,890) |
| (3) Forage crop production, breeding, disease and quality investigations | (769,751) | (809,760) | (−4,360) | (20,000) | (825,400) |
| (4) Rubber production, breeding, and disease investigations | (38,471) | (33,900) | (−160) | | (33,740) |
| (5) Sugar-plant production, breeding, disease and quality investigations | (806,787) | (535,330) | (−2,920) | | (532,410) |
| (6) Tobacco production, breeding, disease and quality investigations | (244,946) | (260,020) | (−1,550) | | (258,470) |
| (7) Drug, oil, insecticide, tannin, flavoring, and special product plant investigations | (90,790) | (99,180) | (−440) | | (98,740) |
| (8) Hop production breeding, disease, and quality investigations | (27,566) | (29,830) | (−180) | | (29,650) |
| (9) Weed control investigations | (176,071) | (187,430) | (−1,070) | (40,000) | (226,360) |
| (b) Horticultural crop investigations | 2,999,250 | 3,500,650 | −18,650 | −275,000 | 3,207,000 |
| (1) Deciduous fruit investigations | (447,884) | (468,430) | (−2,580) | | (465,850) |
| (2) Citrus, avocado and other subtropical fruit investigations | (159,964) | (176,390) | (−980) | | (175,410) |
| (3) Nut investigations | (275,444) | (293,350) | (−1,730) | | (291,620) |
| (4) Vegetable investigations | (601,646) | (634,550) | (−3,580) | | (630,970) |
| (5) Potato investigations | (190,537) | (185,680) | (−1,130) | | (184,550) |
| (6) Plants for landscaping and ornamental purposes and farm windbreaks, investigations of | (242,026) | (254,170) | (−1,610) | | (252,560) |
| (7) Methods of handling, transportation and storage, and market diseases of fruits and vegetables, investigations of | (429,872) | (451,960) | (−2,690) | | (449,270) |
| (8) Plant introduction, testing and maintenance of basic stocks | (355,414) | (432,760) | (−2,360) | | (430,400) |
| (9) Investigations to reduce crop damage caused by nematodes | (120,851) | (129,480) | (−740) | | (128,740) |
| (10) Basic studies of plant growth and development | (73,700) | (74,600) | (−540) | | (74,060) |

*Project statement*—Continued

| Project | 1951 | 1952 (estimated) | Increase (+) or decrease (−) | | 1953 (estimated) |
|---|---|---|---|---|---|
| | | | Pay adjustment absorption | Other | |
| 1. PLANT, SOIL, AND AGRICULTURAL ENGINEERING RESEARCH—con. | | | | | |
| (b) Horticultural crop investigations—Con. | | | | | |
| (11) Research on plant disease epidemics and the identification of disease organisms | ($101,912) | ($124,280) | (−$710) | | ($123,570) |
| (12) Construction of laboratory at Orlando, Fla., for citrus and subtropical fruit research | | (275,000) | | (−$275,000) | |
| (c) Forest disease investigations | 434,512 | 499,000 | −3,000 | | 496,000 |
| (1) Diseases of forest and shade trees and forest products | (434,512) | (499,000) | (−3,000) | | (496,000) |
| (d) Soils, fertilizers, and irrigation investigations | 2,614,923 | 2,625,000 | −14,000 | +475,000 | 3,086,000 |
| (1) Soil improvement, management and irrigation investigations | (1,123,632) | (1,180,080) | (−6,440) | {(+75,000) (+150,000)} | (1,398,640) |
| (2) Fertilizers and their improvement | (224,572) | (216,780) | (−1,250) | (200,000) | (415,530) |
| (3) Soil classification for crop production | (1,030,357) | (1,092,260) | (−5,550) | (+50,000) | (1,136,710) |
| (4) Investigations of the relation of soils to plant, animal, and human nutrition | (131,662) | (135,880) | (−760) | | (135,120) |
| (5) Construction or acquisition of buildings, facilities, and equipment at new Southwest Irrigation Field Station, Brawley, Calif. | (84,700) | | | | |
| (e) Agricultural engineering investigations | 1,103,082 | 1,146,000 | −6,000 | +13,000 | 1,153,000 |
| (1) Farm machinery | (365,281) | (379,160) | (−2,280) | (+13,000) | (389,880) |
| (2) Farm structures and related investigations | (243,073) | (257,820) | (−1,320) | | (256,500) |
| (3) Mechanical processing of farm products | (269,511) | (280,800) | (−1,400) | | (279,400) |
| (4) Farm electrification investigations | (225,217) | (228,220) | (−1,000) | | (227,220) |
| Subtotal | 10,481,455 | 11,335,650 | −61,650 | +273,000 | 11,547,000 |
| 2. NATIONAL ARBORETUM | | | | | |
| (a) Operation and maintenance | 104,514 | 111,000 | | | 111,000 |
| (b) Development of physical facilities | 43,948 | 38,000 | | | 38,000 |
| Subtotal | 148,462 | 149,000 | | | 149,000 |
| Unobligated balance | 54,083 | | | | |
| Total pay adjustment costs | [....] | [774,400] | [....] | [+44,600] | [819,000] |
| Total available or estimate | 10,684,000 | 11,484,650 | −61,650 | +273,000 | 11,696,000 |
| Transfer in 1952 estimates to "Salaries and expenses, Office of Information, Agriculture" | +650 | | | | |
| Supplemental Appropriation Act, 1951, for liquidation of a contract authorization provided in the 1950 Agricultural Appropriation Act | +100,000 | | | | |
| Reduction pursuant to sec. 1214 | +224,300 | | | | |
| Anticipated pay adjustment supplemental | | −758,000 | | | |
| Total appropriation or estimate | 11,008,950 | 10,726,650 | | | |

Senator RUSSELL. We have before us this morning the Bureau of Plant Industry, Soils, and Agricultural Engineering. The budget for that bureau will be discussed by Dr. A. H. Moseman, who is accompanied by a number of his assistants.

Dr. Moseman, you may proceed.

### FOOD PRODUCTION REQUIREMENTS

Dr. MOSEMAN. Mr. Chairman, I would like to review with you first, the status of the work in our bureau and some of the general considerations that enter into the planning for our 1953 estimates.

You have already considered in the hearings with some of the other agencies the increased needs for agricultural production in the years ahead, calling for about a 6-percent increase above the 1951 production and a 50-percent increase over the 1935 to 1939 period.

The requirements of 15 percent more corn from only 6 percent more acres, 18 percent more wheat from slightly less acreage, 29 percent more grain sorghums from 18 percent more acreage, and 12 percent more flaxseed from slightly less acreage; all indicate that each one of our acres is going to have to do more.

### RESEARCH ESSENTIAL TO MEET INCREASING FOOD NEEDS

It is estimated that the population in this country by 1975 will be about 190 million. This means that the most effective application of the research results from our bureau and other research bureaus is mandatory if we are going to meet the needs of our expanding population with the minimum labor and with adequate regard for improving our soil reserves and soil productivity for the increased production in the years ahead.

The development of improved crop varieties; more efficient and reliable measures for control of plant diseases, weeds, and nematodes; greater yields per acre; soil-management research to determine not only how to achieve higher production today, but also how to obtain this production while conserving and improving our soil resources; and the application of engineering principles to develop machines and facilities that will enable a still smaller labor force on our farms to plant, harvest, handle, and store our crops; all of these things will be important.

Senator RUSSELL. We have gotten down to about 2¼ acres of cultivated land per capita; have we not?

Dr. MOSEMAN. I think it is something like that.

Senator RUSSELL. And if the population trend continues up as rapidly as it has over the past decade, we will be down to 2 acres or less per person by 1975.

Dr. MOSEMAN. We will have fewer acres, Senator, and also an anticipated smaller labor force to do this agricultural production job.

### STATUS OF BUREAU RESEARCH WORK

I would like to comment briefly on the status of the research work in our bureau in relation to our ability to do the job ahead of us.

As you know, our appropriations have not quite kept pace, percentagewise, during recent years, with expanding operating costs and higher salaries.

In addition, we have had several substantial cuts in appropriations. Consequently, we are finding it impossible to maintain the kind of vigorous research program in many of the research fields for which our bureau has the responsibility.

In our type of research, the effectiveness of our program is tied directly to the number of scientists that we have and the number of people available to aid them.

Our employment records, therefore, are one gage that we have for measuring the scope and effectiveness of the work we are doing.

### RESEARCH WORKERS REDUCED 17 PERCENT FROM 1940

We estimate this year our average annual positions under the appropriation at 1,985; this compares with about 2,400 in 1940. That is 415 fewer people today than we had a decade ago, a reduction of about 17 percent. This general declining trend in our personnel has seriously affected all of our bureau's research work.

### OPERATING ECONOMIES

To offset the effects of higher operating costs, we have made adjustments to stretch our research funds as far as possible. We have cut our maintenance and repair work to a minimum, perhaps further than is consistent with the best management of Government property. We have reduced our travel, which has limited our ability to keep in touch with our field-research programs, which, as you know, are regional and national in scope. We have cut down on our purchases of equipment and have made about as many reductions as we believe possible in all the operating items.

But despite savings through improved management and economies on operating items, we have been unable to avoid reducing our research program.

We know that there is another way to get the research job done in addition to asking for more money, and that is to make shifts within the funds, within the support that we have, in order to concentrate on the more significant and serious problems.

### REORIENTATION OF PROGRAM

During the past year we have reoriented work along several lines in order to concentrate on problems seriously in need of intensive study. That means that on some important problems we have had to drop work that is still producing valuable and needed information. We shifted our emphasis in the grain-storage investigations in order to initiate some urgently needed research in this field in the Southeast. Problems of grain storage in the South have become critical because of the rapidly expanding livestock industry in that area, and grain losses have been estimated to reach 15 percent annually throughout most of that area.

In order to take on this additional work, we discontinued our cooperative corn and grain storage work at one of the three locations in the Middle West, and also discontinued our studies on rice drying and storage in Texas in order to support this cooperative grain-conditioning and storage work in Virginia and Georgia.

GRASS AND LEGUME SEED HARVESTING EQUIPMENT

We closed out our farm machinery project on improvement of equipment and machines for harvesting sweetpotatoes in order to initiate studies to develop improved equipment and methods for harvesting grass and legume seed.

We have had losses up to 60 percent or more with the machines that are currently used for harvesting grass and legume seed.

BLACK-SHANK DISEASE OF TOBACCO

A third example of shift in emphasis is the work we are doing on the black-shank disease of tobacco, which has spread rapidly in recent years. Tobacco growers in the Carolinas, Kentucky, and Tennessee consider the black-shank disease problem to be most critical.

We have transferred some funds into tobacco breeding in order to speed up development of varieties resistant to black shank.

This shift of funds has helped, but our tobacco-breeding program is still inadequate to meet this serious black-shank-disease problem.

STEM RUST OF WHEAT

Similarly, as you know, we have strengthened our research to develop wheat varieties resistant to stem rust. In 1951 the Bureau transferred funds from several other projects in order to concentrate research on the new wheat-stem rust race 15B. The breeding work was intensified at several field locations and a large number of the 13,000 wheat varieties that we have in our world collection have already been screened at Beltsville and at a few other locations in our search for sources of resistance to this disease.

Seed stocks of several hundred of the more promising resistant lines were increased during the winter of 1950–51 at the new Brawley, Calif., station. We also have about a thousand lines at that station this winter for increase and we plan to send the seed north in time for spring planting in Minnesota and the Dakotas.

We recognize, of course, that the appropriation increase we had last year has helped materially to strengthen this important program.

We have a similar situation in regard to wheat diseases out in the Pacific Northwest, where the seriousness of the bunt problem has increased again in recent years.

Senator YOUNG. Before you leave the subject of the rust research, I would like to ask you a few questions on that.

Dr. MOSEMAN. Surely.

FUNDS FOR STEM RUST RESEARCH

Senator YOUNG. The Budget Bureau cut your request for research funds; is that not correct?

Dr. MOSEMAN. We have had a series of reductions, as you know, Senator, in recent years. It was not necessarily specifically for wheat.

Senator YOUNG. As you know we used to have losses in wheat production. Only a few years ago we would lose entire crops of wheat. Many fields were not worth harvesting.

In recent years there have been some excellent new strains developed that are very resistant to rust.

Then came this 15B type rust and the experts feel that the amount of money which would be made available to them under this budget would be insufficient to combat this new menace.

I have a communication from a top expert in North Dakota in the form of a letter from the North Dakota Agricultural College and another one from the Rust Prevention Association with headquarters at Minneapolis. Both of them feel that these funds should be increased.

Do you feel that there is a real need for increasing these funds?

Dr. MOSEMAN. Yes, I do, Senator.

Our situation is about this; it is true in the cereal program as well as some of the others. In many lines of work in the Bureau, our personnel is down from 25 to 35 percent compared with 1940, and 1941, the recent prewar years. That means that we are not able to keep up as well in developing varieties resistant to these new races of rust, for example.

The situation caught up with us with regard to 15B stem rust of wheat. The black-shank disease of tobacco is about the same; we are just not able to keep pace with the development of the disease. The bunt of wheat in the Pacific Northwest is in the same category.

We have several diseases of sugar beets, yellow wilt, and virus yellows disease, that we know are in South America and European countries. We know they are going to get to this country. In fact, there is some indication that the virus yellows disease is already here.

But with the reduced scientific staff, we are not able to devote the attention to starting along hybrids that are resistant to these diseases, except in a very small way.

### RESEARCH ON WHEATS RESISTANT TO WHEAT STEM SAWFLY

Senator YOUNG. Two other items mentioned were research to find new brands of wheat that would be more resistant to sawfly damage, and smut and aphid control which requested a small increase.

Could you take care of that by doing less work on less important fields of research in your department, or do you feel you need to have additional appropriations?

### DIFFICULTY OF MEETING NEW RESEARCH PROBLEMS BY TRANSFERS WITHIN EXISTING FUNDS

Dr. MOSEMAN. We feel, Senator, that we will have to have additional funds. In order to pick up more funds for work on sawfly we would have to drop something else. We have already gone through that process quite a number of times.

Senator YOUNG. Are there some fields of research where you have pretty well completed your work?

Dr. MOSEMAN. What has happened is that savings from completed research has largely been required for the continuous absorption of pay act costs and also some of the other cuts in appropriations. When we get to looking around now, which is what we have done, to find what we feel are soft spots in our program, we are down pretty well to bedrock. We do not see any place else where we could cut.

We have tried to get along with as much of a reduction as we possibly can. We are cutting out where it hurts somebody else now in order to do work on some of these most urgent projects.

RECOMMENDATIONS OF RUST PREVENTION ASSOCIATION

Mr. YOUNG. Mr. Chairman, with your permission I would like to read from the letter I received from the Rust Prevention Association on this topic.

Senator RUSSELL. Very well.

Senator YOUNG. The executive secretary, Mr. Donald Fletcher, cites three items of top importance, as follows:

1. Stem-rust-research studies to combat race 15B now receives approximately $59 thousand. An additional $40 thousand is really needed to put this work on an adequate basis as we now see it. The States which grow wheat are appropriating several times the amount now being spent on stem-rust research by the Federal Government.

2. Wheat-stem-sawfly breeding research is now receiving $10 thousand. The entomological phase of sawfly research now has adequate funds with which to work, but without an additional $15 thousand or a total $25 thousand for plant-breeding research on sawfly work, the solution of this problem will be greatly delayed.

3. The problem of smut control in wheat throughout the Pacific Northwest has grown very rapidly in the last few years. New races of smut have complicated the wheat-breeders program, and a minimum of $20 thousand additional is needed for smut research.

Mr. Chairman, I received quite a similar letter from the director of the North Dakota Agricultural Experiment Station, Mr. Dean Walster, which I would like to have inserted in the record.

Senator THYE. Mr. Chairman, right at that point, let me say—if the Senator will allow me to make the statement—that I have similar letters on my desk, and if the Senator was not inserting those in the record, then I should have asked to insert them.

I should just like to associate myself with Senator Young in the insertion of these letters, because they are identical to the letters that I have received on the same subject. I am glad Senator Young is having that inserted in the record.

Senator RUSSELL. Both letters will be inserted in the record at this point.

(The letters referred to follow:)

RUST PREVENTION ASSOCIATION,
*Minneapolis, Minn., March 18, 1952.*

Hon. MILTON YOUNG,
*Senate Office Building, Washington, D. C.*

DEAR MILT: I have been working with a number of commodity groups in the spring wheat area on the needs of the national agricultural research program. This office has prepared and sent out to all the Members of Congress a statement showing these needs. You will receive a copy in the very near future.

I realize that very little can be done this year except to hold the line for the worthy research items included in the budget. However, there are three which we feel should receive some little increases in order to protect wheat production. I am listing below the three items which I feel are suffering most from lack of funds and am including suggested increases for your consideration.

1. Stem-rust research studies to combat race 15B now receives approximately $59,000. An additional $40,000 is really needed to put this work on an adequate basis as we now see it. The States which grow wheat are appropriating several times the amount now being spent on stem rust research by the Federal Government.

2. Wheat-stem-sawfly breeding research is now receiving $10,000. The entomological phase of sawfly research now has adequate funds with which to work, but without an additional $15,000, or a total of $25,000, for plant-breeding research on the sawfly work, the solution of this problem will be greatly delayed.

3. The problem of smut control in wheat throughout the Pacific Northwest has grown very rapidly in the last few years. New races of smut have com-

plicated the wheat breeders' program, and a minimum of $20,000 additional is needed for smut research.

All of the projects listed above are included in the Bureau of Plant Industry, Soils and Agricultural Engineering budget. Any assistance you can render in obtaining the three increases suggested will be greatly appreciated, not only by our organization but by the grain growers of the Nation. * * *

Sincerely yours,

DONALD G. FLETCHER,
*Executive Secretary.*

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NORTH DAKOTA AGRICULTURAL COLLEGE,
AGRICULTURAL EXPERIMENT STATION,
*State college station, Fargo, March 17, 1952.*

Hon. MILTON YOUNG,
*United States Senate Office Building, Washington, D. C.*

DEAR SENATOR YOUNG: None are more thoroughly aware than you and your North Dakota colleagues in the House and the Senate of the necessity of continuous support of agricultural research. North Dakota citizens have demonstrated their interest in agricultural research through generous support of the State's agricultural experiment station system. The following table compiled from the annual reports of this station of the last 3 years shows that Federal funds have annually accounted for only 19 cents out of every dollar available:

*Funds made available to North Dakota for the support of agricultural research by the North Dakota Agricultural Experiment Station*

| | |
|---|---|
| Total Federal grants (fiscal 1949, 1950, and 1951) | $499,359.01 |
| Total non-Federal for the 3 years | 2,120,118.83 |
| Total funds available for the 3 years | 2,620,376.84 |
| Percent that Federal grants were of total available | 19.05 |

North Dakota farmers are prime producers of hard red spring wheat, durum, barley, oats, and potatoes. They are constantly calling for better varieties, and for more know-how on the use of fungicides, insecticides, weed killers, rodent killers, etc. Excellent progress is being made in the program to secure resistance to race 15B of stem rust.

North Dakota has already had several seasons in which aphids did much damage to small grains and they still continue to be a threat to potatoes. Satisfactory aphid killers and safe effective methods of control still require much research. Aphids transmit the yellow dwarf disease which has seriously attacked cereals in Kansas and Nebraska and has already been reported as having occurred in South Dakota in 1951. North Dakota cannot hope to escape. Breeding for resistance to aphids and to the virus diseases they may introduce is going to be a long difficult task. It should be begun now.

Progress is being made in getting a sawfly resistant variety of hard red spring wheat. Rescue, of Canadian origin, offers considerable relief. Canadian plant breeders are releasing a better sawfly resistant variety this year to be called Chinook. We have it under test at the Minot Station in the sawfly area.

Crop and animal protection are peculiarly a national as well as a State problem because plant diseases, insect pests, and animal diseases recognize no State boundaries. You are aware of the threat to the American livestock industry of the outbreak of hoof-and-mouth disease in Canada. The swiftness with which the Canadian Government has moved is most gratifying. Our own Federal agencies must be completely supplied with necessary means for continued watching of the whole border.

That there should be much more national recognition of the dangers to livestock, humans, and their animal pets from the dreadful disease rabies is increasingly evident. Our veterinarians assure me that rabies is likely to take a heavy toll from livestock in North Dakota this summer. Sentimental interest in the preservation of rabies-transmitting forms of wildlife must not be permitted to stand in the way of the control of a disease which threatens both man and domestic animals.

I am sure that you must have examined with interest the February 1, 1952, document from the United States Department of Agriculture entitled "A Report on the Insect and Plant Disease Control Programs of the United States Department of Agriculture."

You will note on pages 80 and 81 of this report that we sent our associate director to the hearings held by the study group. The hearings were also attended by the Honorable Math Dahl, commissioner of agriculture and labor, and a group of farmers. Referring to the section on grasshopper control, pages 14–16, may I particularly stress item 3-d on page 16 which reads: "On Federal lands, the Federal Government is responsible for control operations, not only to prevent undue damage to forage on its own property, but to prevent spread of the pest to neighboring lands. When Federal land has been leased, the lessee has a responsibility for participating in pest control." Many different Federal agencies other than the United States Department of Agriculture own land in North Dakota. Past experience in grasshopper-control programs have indicated very poor cooperation on their part on such federally owned lands, particular difficulty having been encountered on the Indian reservations.

Referring to the section of the report on stem-rust-barberry eradication, pages 32–36. That statement has my hearty endorsement, particularly item K on page 35 which reads: "Breeding of varieties of grain resistant to rust should be continued." In this connection may I emphasize the importance of continued support of the Division of Cereal Crops and Diseases in the Bureau of Plant Industry, Soils, and Agricultural Engineering to the end that they may continue their splendid cooperation with the State stations. Assignment of Federal personnel from that Division to work in North Dakota in cooperation with this station is an excellent example of Federal-State cooperation which not only serves North Dakota but also the entire Northern Great Plains area. Out of this cooperation in plant breeding alone there has come in recent years four new varieties of durum wheat, namely Stewart, Carleton, Vernum, and Nugget—and what is more important the first steps in securing resistance to rust race 15B, which began in 1944, even before the 1950 epidemic hit, when Dr. G. S. Smith began to make crosses with Khapli emmer, a wheatlike species immune to race 15B. Two varieties of flax, Cheyenne and Marine, immune to races of flax rust now known to occur in the United States are also the product of this cooperative attack. The recent assignment of a full-time Federal cereal-plant pathologist to this station now provides us with personnel to make greenhouse tests of both hard red spring and durum seedlings in the earliest stages of breeding for their resistance to 15B rust and other strains as well.

My apologies for writing to you at so great a length.

Sincerely yours,

H. L. WALSTER,
*Director, Agricultural Experiment Station.*

Senator YOUNG. I might add that Dean Walster, of the State experiment station in North Dakota, has been doing marvelous work with the amount of funds that he has received.

As you know, they have developed several outstanding varieties of wheat, which increased wheat yields as much as 25 or 30 percent and right during the war period when we needed production most.

I do not know of any appropriation which is more important to agriculture or from which the Government receives more benefit than from research funds.

### COOPERATION WITH BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Senator RUSSELL. Is not a certain amount of this work done by the Bureau of Entomology and Plant Quarantine?

Dr. MOSEMAN. They cooperate with us, Mr. Chairman, in projects such as the development of varieties resistant to the wheat stem sawfly. We plan and make the crosses and then they assist us in testing the segregating material for resistance to the insect.

I might point out that the primary problem that we have right now on this sawfly project is the need for expansion of the breeding work, as recommended by Mr. Fletcher. The way to control the wheat stem sawfly most economically is to develop resistant varieties. That means

that we have to go through a long series of tests. An improved variety bred for resistance to the sawfly also must be resistant to the rusts, including 15–B, and to the smuts and bunt and all these other things.

### WHEATS RESISTANT TO SAWFLY

Senator YOUNG. Dean Walster pointed out in the letter that some of the new varieties that are resistant to the sawfly come from Canada. Are the Canadians spending more money on research for the sawfly than we are?

Dr. MOSEMAN. I don't believe they are, Senator Young. It happened that they had this variety called Rescue that they developed quite a number of years ago in Canada. It was used as a kind of a stopgap when the sawfly first became bad in Montana and North Dakota.

They have also recently released one other variety, Chinook.

They started concentrating on the sawfly problem a bit earlier than we did, and I think they devoted a little more of their total effort to it. But they probably don't have any more work on it at the present time, except that they just happened to have that one variety, which is still about the best from the standpoint of sawfly resistance.

But it is low in yield and quality. In fact, it is so inferior that many of the farmers out in that area are not growing Rescue, even in some of the sawfly infested regions, because of its lower yield.

Senator RUSSELL. Do you get any research and marketing funds for work of this nature, Dr. Moseman?

Dr. MOSEMAN. Not for this, Mr. Chairman. The research and marketing funds, that is, the present RMA title II funds, are for marketing problems.

We do have $10,000 that came under the old title I of the Research and Marketing Act. As you know, these funds have now been merged with the appropriations to the research bureaus.

Senator RUSSELL. That is the question I had in mind.

Dr. MOSEMAN. The funds came from the former section 10 (b) of title I.

Senator RUSSELL. That was the question, that you do get your money through the research and marketing funds.

Dr. MOSEMAN. Yes.

### COOPERATION WITH STATE EXPERIMENT STATIONS

Senator RUSSELL. I suppose most of their work is done in conjunction with the State experiment stations like the one in North Dakota.

Dr. MOSEMAN. That is right. We cooperate. We are working with the people at Fargo and also with the Montana Experiment Station.

Senator RUSSELL. Do your scientists, who are paid with these funds, work directly with scientists that are paid by State funds?

Dr. MOSEMAN. Yes. Our relationship is about this: We furnish, in most cases, technical personnel, that is, pathologists, who work on the disease side; plant breeders, who make the hybrids, and so on. The State cooperates by furnishing labor and technical personnel, office space, greenhouse and laboratory facilities, field plots, and that type of thing.

It is a pretty good 50–50 proposition.

We feel that the States are putting as much into each one of these programs as we are, if not more. Of course, we are interested in their work because these problems cross State lines.

This sawfly covers quite an area and, of course, race 15–B covers nearly all the important wheat-growing area of the country.

### RESEARCH SUPPORT FROM STATE EXPERIMENT STATIONS

Senator RUSSELL. I just want to to ask this question, not with specific reference to this work with various diseases that attack wheat, but with all your experimental work generally.

We keep on hearing about the difficulties that you are encountering in carrying on this important research work due to the fact that the cost of labor, common labor and things of that kind, has increased so greatly over the past few years. Has any effort been made with respect to all of this work, like your tobacco work—I assume you have that in Tifton and points in North Carolina—to get the State to pick up that part of the lag where these scientists could carry on their scientific work expeditiously and without being hampered by the lack of labor, which is an important element in all agricultural research?

You have to have a considerable amount of common labor in practically all of this research work. I was wondering if perhaps some of the States could not pick up some part of that even if they do not have the scientists to contribute to the projects.

Dr. MOSEMAN. We try, in most cases, to have the States contribute the common labor, Mr. Chairman. One of the reasons is that common labor costs vary so much; that is, the wage scales vary so much throughout the different sections of the country that it would be rather difficult for us to employ labor using a standard civil-service rate for it.

So in many cases we have an arrangement with the States where they employ the labor and pay the going wage for that particular area.

We hire primarily technical people. Some subprofessional people, of course, are also hired by the Bureau.

Senator RUSSELL. A thought occurred to me in the last meeting of this committee. Senator Hayden was discussing some poultry experimental work that was being carried out in Arizona. They had an excellent scientist there but he had to spend all his time doing all the actual manual labor at the station.

It seems to me that in this day of a tight budget, of economy drives consistent with decreased Federal expenditures, that if the Federal Government offers the technical and scientific knowledge that is necessary to carry on this experimental work—and it must be carried on—it seems to me that the States might at least pick up the check for the labor cost.

Dr. MOSEMAN. They certainly are, Mr. Chairman. In fact, I think, as we have examined our program, we feel that they are carrying more than their half of the load, because in recent years, as a means of absorbing some of our Pay Act costs and things of that sort, we have asked the States to take on a greater share of the burden.

In many instances now, we are down to where we hire just the technical men. They get a little money for travel and just a very small amount for operating expenses.

In fact, we feel that some of the States might be carrying too large a share for problems that have regional importance.

Senator RUSSELL. If you distribute it around it will equalize itself because there is scarcely a single problem that you have confined to any one State. The impact of your work will be felt in areas everywhere, and if all of the States would come in, it would be helpful.

My own State used to be a very poor State and is still not in the upper bracket, but we have managed to stay out of debt pretty well up there and had a surplus last year; which is somewhat a different case from the Federal Government with a $62 billion deficit last year and it looks like we are going to run a considerable deficit this year.

Will you proceed with your statement, Dr. Moseman?

### UTILIZATION OF RESEARCH INFORMATION

Dr. MOSEMAN. I would like to mention also some of the steps that we have taken, Mr. Chairman, in getting research information into use. We recognize that the primary responsibility of our Bureau, of course, is to develop information and improvements through research; but we are also deeply aware of the need for prompt application and use of these results.

So, in this connection, several members of our staff have worked very closely with the personnel of the Agricultural Conservation Programs Branch of the Production and Marketing Administration in the evaluation of recommended practices and in summarizing research results that the Agricultural Conservation Programs Branch can put into effect in meeting their production goals.

We have also had a member of our staff playing a leading part in the development of the grasslands program, in which the land-grant colleges and the universities are cooperating.

We feel that that program, with its potential for increased production of food and feed, will represent one of the most significant activities undertaken by our agricultural leaders in recent years.

### RELEASE OF NEW VARIETIES

We have continued to release new varieties of crops just as soon as we have been convinced of their superiority. We have released about 40 new strains of field and horticultural crops from the Bureau program during the past year.

### DISSEMINATION OF INFORMATION ON WEED CONTROL IN COTTON

One other program that I might mention in connection with getting research information into use, to illustrate the teamwork that we have with industry, is in connection with the control of weeds in cotton. Cotton growers are confronted with the problem of having to do the job next year with probably still less labor than they have had this year and in years past. That means that they are paying more and more attention to the control of weeds through the use of satisfactory herbicides such as we now commonly use in controlling weeds in grain and corn and so on.

We have not done enough work to develop what we feel would be sound, reliable information on which to base recommendations because our program on the weed research in cotton has been pretty small. But a number of the industrial concerns have been putting out dinitro compounds and other materials in the Cotton Belt and have developed quite a little information, through their experience, that has been useful.

So we have taken our research information, plus the practical experience that they have gained, and, on the basis of that, developed recommendations for cotton growers for next year.

Senator RUSSELL. Of course, I am interested in cotton. It seems to me that weed research would be important in a great many crops that are not clean cultivated like cotton is. You chop cotton a couple of times and plow it about three to get a good crop.

Dr. MOSEMAN. I think that is right. In fact, we have probably had more interest in weed control research from all the crop or commodity interests than we have had in any other single program.

The reason for its being of so much concern to the cotton grower is that the cotton grower figures that as long as he has to have the hoe hand around to keep his cotton clean he is not going to be able to reduce his labor force. So he figures this is a real bottleneck in his ability to cut down on the labor requirement for growing his cotton.

We are concentrating our weed control research on the grain crops, on weed control in irrigated areas, and on doing a little work on weed control in pastures, although there is still a lot that needs to be done there, particularly in regard to brush control.

Senator RUSSELL. You have been doing some work for sometime on weeds that get into western pastures, have you not?

Dr. MOSEMAN. That is halogeton. We have not been doing much work on that, Mr. Chairman. We have an item of increase for that this year.

Senator RUSSELL. For this year?

Dr. MOSEMAN. Yes.

### USE OF KRILIUM ON SOILS

Senator RUSSELL. Could you discuss this new allegedly miracle fertilizer that one of the big chemical concerns has put out? I read an article in the paper, if it is correct, that the product can be turned out in quantity, that it will rebuild our soil and grow enormous quantities of crops. I forget the name of it.

Dr. MOSEMAN. Krilium?

Senator RUSSELL. Yes.

Senator YOUNG. I got a small supply of it from a manufacturer for an experiment station near my home.

Dr. MOSEMAN. We have worked with the Monsanto Chemical people for a couple of years in the development of that, and from tests that we have made, plus others that have been reported, the material looks pretty good. The only handicap at the present time, of course, is the cost. It is around $1.75 to $2 a pound.

Senator YOUNG. Is it a fertilizer or chemical which will be effective in areas of greater rainfall, or will it be helpful in semiarid areas?

Dr. MOSEMAN. The material is really not a fertilizer but rather a soil conditioner, that improves the physical property or structure of

the soil. It is most effective, Senator Young, in the heavier clay type of soils, where you have either a drainage problem or a water intake problem.

Senator RUSSELL. It loosens up the soil, does it?

Dr. MOSEMAN. It loosens up the soil. It is not so effective in sandy areas.

We have found that in the western irrigated soils, under certain conditions, one of the difficulties in growing crops has been the water relationship. There is evidence that krilium, by opening up the soil and allowing plant roots to penetrate and water relationships to go on in a more desirable way, that it will have some promise in those areas.

Senator YOUNG. If it does not rain at all it will not help; is that correct?

Dr. MOSEMAN. That is right. You have to have the water.

Senator RUSSELL. Is there any hope of getting a substitute for water any time soon?

Dr. MOSEMAN. Krilium does look promising. It looks like one of those things that we certainly want to do everything we can in order to keep abreast of it.

Senator RUSSELL. What are the prospects for being able to produce it at a lower cost, if produced in quantity?

Dr. MOSEMAN. The folks that manufacture it feel that they can get the cost down; how much is problematical.

Senator RUSSELL. Is it a byproduct of some chemical?

Dr. MOSEMAN. No; as I understand it, it is similar to the nylon compound. I do not understand the basic chemistry involved, but it is a similar product to nylon, as far as the chemical structure is concerned.

But they do feel they can get the cost down. In fact, even now, with the present cost, they feel that the material can be used in special-purpose greenhouses and various types of small garden plots where they do not need very much of it, to work in just a small area and improve the soil condition.

It would be useful probably to some of the backyard gardeners who have a heavy, compact soil, for either vegetable production or flower gardens, either one.

### USE OF NON-FEDERAL FUNDS FOR RESEARCH

Senator YOUNG. Is the Department, in its various stations throughout the United States, receiving increasing amounts of non-Federal funds for research?

Dr. MOSEMAN. I don't think they are increasing particularly, Senator Young. We do have a number of such non-Federal grants.

You are familiar, of course, with the $10,000 grant we got from the Grain Terminal Association to work on wheat stem rust 2 years ago, and we have had similar grants of about that same size or smaller from different concerns who are interested in specific problems.

### STATE SUPPORT OF AGRICULTURAL RESEARCH

Senator YOUNG. Dean Walster gave some interesting figures in his letter. He said that the total Federal grants to the North Dakota experiment station for the fiscal years 1949 through 1951 amounted to

$499,359.01, and the total non-Federal grants for the 3 years amounted to $2,120,118.83, so that the Federal grants were 19.05 percent of the total.

Dr. MOSEMAN. The State experiment stations funds have increased considerably more than the Federal appropriations for this purpose, and, of course, industry groups have increased their research expenditures quite materially in recent years.

Senator YOUNG. Have State appropriations on an average been going up or down?

Dr. MOSEMAN. They have been going up. I do not know that I have any percentage figures to give you, but they have increased in most instances.

Senator YOUNG. Years ago I was chairman of the State senate appropriations in my State, while times were tough. We appropriated but little for experiment stations but left it almost entirely to the Federal Government.

However, we have been doing better in recent years.

Dr. MOSEMAN. We have one of those seesaw relationships, Senator. During the years when the State appropriations are coming along, as they have been in recent years, we expect them to take care of more and more of the job. There is the case of the rust work, for instance.

There are other times when our appropriations have been a little more favorable and some of the States have been hit pretty hard, and we have probably absorbed the shock there.

But we do have a teamwork situation with the State stations in order to keep on getting the job done in most of these cases.

Senator YOUNG. What do you do to encourage the various States to match to greater extent Federal funds?

Dr. MOSEMAN. We don't do anything to encourage them to increase their appropriations except insofar as we may plan programs jointly with the States, where we tentatively agree that if the problem is regional or national in scope, that we will present the problem for Federal appropriations and they, at the same time, will ask their States for support for the work.

Aside from that, we don't do anything directly to encourage them to increase their support.

### COOPERATION WITH INDUSTRY

Senator RUSSELL. We hear constantly that great sums are expended by private industry for various types of research. What is your relationship with firms like Monsanto and du Pont and others who carry on very intensive research, a great deal of which would be related directly and indirectly to agricultural problems? Do they call you in to consult when they plan a project, or do you get into it after the project has developed and there is some substantial indication that it would be of value to agriculture?

Dr. MOSEMAN. We take advantage of the products that those companies are putting out all the time. We test them—many of them are chemical products—to see whether or not they have any application as, let us say, a herbicide or something of that sort.

In other words, our relationship is one where they make certain types of materials available and we work with them in evaluating

these materials, with the understanding, of course, that anything that comes out of our Federal part in that program is available to the public and not restricted in benefit to that individual company.

We have adequate safeguards for that.

But we do not serve as consultants for any individual companies. Of course when called upon for assistance in our field of research responsibility we do give them the benefit of guidance that will improve their ability to solve problems that we can assist on.

Senator RUSSELL. Does that situation arise just every now and then, or do they keep in reasonably close touch with your chemists and scientists?

Dr. MOSEMAN. It varies considerably. Some companies have different materials that are constantly coming along and we have more or less an understanding with them that if something is showing up that they feel has promise, we will be glad to work with them in testing it.

There is really no standard pattern on that.

Senator RUSSELL. All right, Dr. Moseman.

Senator CORDON. Might I ask at this point: Who was it that discovered the fact that a detergent was just as good as an antibiotic?

Dr. MOSEMAN. I am not sure who discovered that, but it is making quite an impact now in animal feeding tests. I know that.

Senator RUSSELL. Will you proceed with your statement, Dr. Moseman?

Dr. MOSEMAN. We do have four items of increase here, Mr. Chairman, which we would like to discuss briefly, unless you have some other questions on the general situation. We can probably get back to that later.

## NEED FOR ECONOMY

Senator CORDON. Mr. Chairman, has anybody asked the witness how we are going to cut this down?

Senator RUSSELL. No, sir; not yet.

Senator CORDON. That is my question.

Dr. MOSEMAN. We certainly appreciate that, Senator Cordon.

As I have already stated, we have tried in every way possible to shift our funds from those softer spots or places where we think the work is less important, to do this or that job that we recognize is more important.

Senator CORDON. I will say to you here that, as far as I am concerned, this is one of the most important things in which the Government engages. At the same time there are a lot of other important things, and we have to do something to get this budget down to where we can handle it or none of us will be engaged in anything.

## PROGRAM REVIEW BY ADVISORY COMMITTEES

Dr. MOSEMAN. Our situation, Senator, is about this: We have had these advisory committees that were set up under the Research and Marketing Act. They have been going over our program with us and making recommendations where we could cut, or where we should shift funds, as well as where we need more work.

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We have had recommendations from them, about 141, from their last year's meetings. If we were to carry out each of those recommendations, it would take about $5 million more than we are now requesting.

The problem that faces us, as research administrators, is how we can squeeze $5 million more worth of work from the funds we have now.

### RESEARCH ON ORNAMENTALS

Senator CORDON. What do you do, for instance, in this item on page 190 of your justifications, (b) (6), "Investigations of plants for landscaping and ornamental purposes and farm windbreaks"?

Dr. MOSEMAN. We have had that one on our list, Senator, as one we thought probably would not contribute as much to our needs right now while we are in a semidefense situation.

But when we get to looking at it with the florist industry and the people that are using the results of our research, they point out that we are doing only about 20 percent as much as we ought to be doing in that field. Since 1940 this work has already been reduced about 36 percent below the level of our other projects.

Senator CORDON. What they are pointing out is that you are only doing twenty percent of what they would like to have you do. What about their doing part of it, or furnishing you the money with which to do it?

Dr. MOSEMAN. That, of course, is one of the things that always enters into it.

Senator CORDON. They will never do that until the Government itself does not do it for nothing; is that not correct?

Dr. MOSEMAN. That is right.

Senator CORDON. That is true right straight down the line. It is true in every field; we are in the "gimme" era right now.

Dr. MOSEMAN. The industry is contributing. They are cooperating through the State stations in many areas.

### RESEARCH FUNDS FROM PRIVATE SOURCES

Senator CORDON. Is there a special statute that provides for the Department of Agriculture's several divisions doing work with funds that are contributed from private sources?

Dr. MOSEMAN. Yes; we can use private funds. In fact, we have a number of instances where we are doing that. That is the case that I mentioned just briefly a minute ago. The Grain Terminal Association out in St. Paul is interested in this rust problem of wheat. They gave us $10 thousand for us to work on that.

Senator CORDON. I notice here $1,614,000 approximately, in allotments to you from other sources.

Dr. MOSEMAN. Yes.

Senator CORDON. Is that for the current year?

Dr. MOSEMAN. That is for the current year.

Senator CORDON. My attention is just called to the fact that on page 224 you show that somebody did contribute $60 for floricultural research on new methods of production and propagation. You have done a great deal with that.

Dr. MOSEMAN. I don't know offhand just what that was for. It would not buy much today, would it?

We can accept those types of grants and we are accepting everything that we feel we can without tying ourselves strictly to one firm.

Senator CORDON. Would you provide for the record in the citation of the law that permits you to do that?

Dr. MOSEMAN. Surely.

Senator CORDON. I feel, Mr. Chairman, that that may be one answer. If we are going to make any reductions here, if the law itself is broad enough to permit of the use of all of the facilities of Government, including its expert help, for desirable research, and permits also those who have a special interest in it to contribute to that purpose, we might be able to make some reductions here and still keep doing the work that is desirable and necessary.

Senator RUSSELL. Will you give us that citation, Dr. Moseman?

Dr. MOSEMAN. Yes.

(The information requested follows:)

Miscellaneous contributed funds received by the Department from States, local organizations, individuals, and others are available for work under cooperative agreements (5 U. S. C. 67, 563).

Senator YOUNG. It would seem to me that if cuts were to be made, you could accomplish it most effectively where they make the least contributions to the program by local interests.

In other words, if those directly concerned are not interested in putting up sizable funds in the way of matching, it ought to be a good reason for cutting those particular programs.

Dr. MOSEMAN. That is one gage, Senator. Of course, the measure that we ordinarily use in our evaluation program is whether or not a particular problem is regional in scope and whether or not the folks that are concerned with the particular commodity, if it is a commodity, have the resources to do the job themselves.

One example that I would like to mention here is our soils work. Soils problems are, of course, not limited geographically. There is no single group that is going to do the soils research work for the Bureau or for the farmers of the United States.

## AGRICULTURAL ENGINEERING INVESTIGATIONS

Senator THYE. Mr. Chairman, that is a thought that occurs to me, that anything in the grain itself or in the plant or in the soils, that there you could not expect private industry to make any extensive research.

On page 192 here you have "Agricultural engineering investigations," and under that you list "Farm Machinery," and "Farm structures and related investigations."

I am just wondering what could be accomplished to bring about economy or how we could proceed to bring about economy in that particular item, and how serious it would be if economy was exercised.

## FARM MACHINERY RESEARCH

Dr. MOSEMAN. The work we are doing under our farm machinery program Senator, is concentrated on those types of machines suited for mechanising production of those crops which have not reached

large scale commercial production so that some industry will come in and do the machine job for the growers.

Senator THYE. What are the crops?

Dr. MOSEMAN. Tung production, for example, is one. We are expanding the production of tung nuts in the United States, and we do not have suitable equipment for harvesting the nuts.

Castor beans are another crop, where, as you remember, the castor bean plant is tall with scattered spikes of beans. It has been quite a problem to develop types of plants and also machines to do the harvesting job with a minimum amount of labor.

We are concentrating on those kinds of problems in the farm machinery research program.

The sweetpotato harvester is one that was mentioned earlier, a sweetpotato digger.

Senator THYE. I was going to ask about the digging of sweetpotatoes. How do they differ from the digging of the Irish potatoes?

Dr. MOSEMAN. The problem is concerned with the different shape of the sweetpotato root. The Irish-potato digger that has been used damages the sweetpotato roots excessively, and we do not get the complete yield of the potatoes. Actually, we have used the Irish-potato digger as a base and modified it in order to develop the sweetpotato harvester.

Senator THYE. How much money do you expend on the project annually?

Dr. MOSEMAN. The sweetpotato harvester project is one we just closed out recently in order to initiate needed work on the grass and legume seed harvesting project.

### FARM ELECTRIFICATION INVESTIGATIONS

Senator THYE. Then No. 4, on the same page, 192, is "Farm electrification investigations." We know that that is a new field and that much excellent research has been done there. Are you spending a considerable sum of money in that field?

Dr. MOSEMAN. We have been spending an increasing amount in that, Mr. Thye. That is one of the areas of work in the Bureau that the Congress has been providing increased funds for in the recent 4 or 5 years.

We have had quite an increase in that research program.

Mr. ROBERTS. The demand there, Senator Thye, has increased tremendously as the rural electrification program has extended into the farm and rural areas.

Senator THYE. I understand that.

But getting back to the machinery, your machine companies, whether they be one or the other, have done a tremendous amout of field research in endeavoring to perfect their machines to meet the need, whether it be Irish potatoes or sweetpotatoes, or any type of harvest.

I can readily see that if we exercised economy there it would not be as serious as if you exercised economy on some of the plant researches or the diseases such as rust, and your weeds.

You also have your corn borer, which is becoming quite a menace throughout all the Corn Belt.

What are you doing in the field of research to eradicate or control the corn borer?

HYBRIDS RESISTANT TO CORN BORER

Dr. MOSEMAN. We are working with State experiment stations in Iowa, Minnesota, Ohio, and other stations in the Corn Belt area, to develop hybrids that are resistant to the borer.

Senator THYE. Are you having any results?

Dr. MOSEMAN. Yes, we are. We have put out quite a number of lines or varieties that have resistance.

Of course, resistance to an insect is kind of an indeterminate thing. I guess if an insect gets hungry enough he is going to attack a crop to a certain extent.

So it is a matter of trying to get enough resistance there that will be effective to prevent the loss. We are kind of climbing that ladder to higher types of resistance. We are making some progress.

FARMERS NEED FOR RESEARCH ON FARM MACHINERY

There is one point in connection with this farm machinery question that you asked, Senator Thye, and that gets back to this question of grass and legume seed harvesting equipment, where we pointed out that we have losses up to 40 and 50 percent.

The thing that bothers us on that is that it is the farmer who actually suffers the loss. The machinery salesmen can go out and sell a grain combine to harvest grass and legume seeds, but it is not until you find out what is being left in the field, that the farmer is losing 25 or 50 percent of his seed crop, that you really realize how ineffective the machine is. The farmer does not have any recourse. He has to use the type of equipment that is available and he is the loser.

Senator YOUNG. If cuts had to be made, would it not be more important to carry on research with the plant and animal diseases than for machinery for harvesting?

After all, if you cannot save the crop there is nothing to harvest.

Dr. MOSEMAN. You are right there, Senator. We cannot argue with that one.

The only difficulty is that as we look at our entire production job, we know that one of the things we are going to have to work for is a reduced labor force on farms. In order to reach that goal, I think we ought to continue to give as much attention to the engineering side of our program as possible.

Actually, we have mechanized agriculture in this country, but if you look at the record of the work done by the State experiment stations and the Federal Government, we have not paid too much attention to improving the mechanical operations in producing many of our crops.

Tobacco is a good example. We just have not done much of anything to improve the mechanization of the handling of tobacco.

Senator YOUNG. There has been a big improvement in the cotton machines.

Dr. MOSEMAN. That is right. They have really made most significant progress there.

Senator THYE. It has been my experience that if the farmer has the income, he will buy the machine that the machine manufacturer designs. But if he does not have the income, it does not make much

difference what the manfacturer designs because he is not going to be the beneficiary of it because he cannot buy it.

Dr. MOSEMAN. That is certainly true.

Senator THYE. I believe in the field of machine research we stand less danger of doing the wrong thing if we economize there, whereas if we fail to keep abreast of the research needed in the plant, in the soil, and in the variety of crops, we can do a greater damage to the producer if we fail in that field than if we failed in some of these other fringe programs.

### INTEGRATION OF ENGINEERING, PLANT, AND SOIL RESEARCH

Dr. MOSEMAN. The point I would like to make is that the Department has combined the agricultural engineering research along with the soils and plant work in order to bring the fields together in such a way that we can get the most complete attention concentrated on the entire problem.

For example, our plant breeders develop varieties that are suited for machine harvest, and if we have the engineers going along at the same time, tooling up their machines at the same time that the plant breeders are developing the types of plants that are suited for the machines, we can do a fairly effective job.

Our castor bean research program is one that falls in that category.

I think we recognize that one of the significant contributions that was made in corn research, in the development of hybrid corn, was to develop a stiffer shank corn with stronger stalks, which held the ears at a uniform height so that we could handle it mechanically. I think that one of the most significant features of this accomplishment is that it has permitted us to mechanize corn production and reduce labor requirements.

We face similar problems now in several vegetable crops in developing the type of machinery for handling some of those crops. We are thinking about that type of joint research where the plant breeders and machine people get together and decide what they can do to modify plants and machines to cut production costs.

### GOVERNMENT AND INDUSTRY RELATIONSHIP IN FARM MACHINERY RESEARCH

Senator FERGUSON. Do you build the machines? That is, when you are experimenting, do you make the machine itself?

Dr. MOSEMAN. Only the experimental models of these farm machines.

Senator FERGUSON. Is not that very expensive for the Government to do that? Would it not be much simpler and better for the machinery companies to do it?

Dr. MOSEMAN. It would be better, I think, if we could depend on the machinery companies to meet that particular need.

Senator FERGUSON. Will you show us what you did last year, what you built, and show us how the machinery companies would not do it and did not do it?

Dr. MOSEMAN. We can give you a statement of that kind. I don't have it right handy. We have been working, for example, on sugar cane harvesters and on tung nut production and harvesting machinery.

Senator FERGUSON. But are not there other companies, manufacturers of those items, and other companies that are working on that same thing?

Dr. MOSEMAN. Yes; there are.

Senator FERGUSON. Do you say, then, that private industry does not go far enough in this research, that it does not do this job of research?

Dr. MOSEMAN. No. The point I was making there was that private industry has not started to concentrate on designing the machines required for mechanizing production of some of these newer crops. I mentioned earlier tung, castor beans, and crops of that kind. Those are really the ones we are concentrating on. We are not developing corn pickers or combines in the normal sense, in competition with the industry people. We certainly would not do that because that is the type of high cost competition we would not engage in.

Senator FERGUSON. They have their agents out in the field. They have been selling this machinery for years. They get the complaints. Their agent is called out on a farm to show that it will work or it will not work; is not that true?

Dr. MOSEMAN. That is right.

Senator FERGUSON. If you duplicate that, it is very expensive to the Federal Government and the taxpayer, is it not?

Dr. MOSEMAN. That is true; except, as I mentioned, we are working on mechanization of the minor crops where the industry people have not gone in.

Senator FERGUSON. Why have they not gone into these other crops?

Dr. MOSEMAN. I think primarily because they are not certain that there is going to be a market for a sizable number of machines.

Senator FERGUSON. Are you certain there is going to be enough of a market?

Dr. MOSEMAN. We are not looking at it from the standpoint of a market for machinery, Senator. We are looking at it from the standpoint of the benefit to the grower of that particular crop and to the needs of our domestic economy.

Senator FERGUSON. But ultimately, if the machine is made, it is going to have to be made by a private manufacturer, is it not?

Dr. MOSEMAN. That is right. The difference is that a single company hesitates to move into a field and to spend any appreciable money on the development of a machine if they are not sure it is going to be in demand.

Senator FERGUSON. Then will you give us the list that I asked for?

Dr. MOSEMAN. All right.

(The information requested follows:)

UTILIZATION OF FARM EQUIPMENT RESEARCH

USDA farm-equipment research is directed primarily toward the establishment of fundamental principles and the determination of basic performance requirements for farm machines. Such investigations are usually carried out in cooperation with agricultural engineers of State research agencies and with the biological scientists who are also concerned with the problems. Requests for the research come largely from commodity advisory committees and farm organizations which recognize deficiencies in existing farm equipment.

Emphasis of the research is placed on those field and farmstead operations where labor requirements are relatively high and on operations where present methods and machines are less efficient and effective. Usually the research is

concerned with those crops or operations for which the farm-equipment industry has not already developed some satisfactory machine. For example, considerable research has been done on specialized crops not providing a large market for machine manufacturers but important in the domestic economy such as tung nuts, castor beans, sweet potatoes, etc. Some of these crops are essential as a source of strategic and critical stockpile materials. Farm-equipment research is also concerned with the effective application of new operations and processes which are being developed by the crop scientists, as for example, operations concerned with the most effective placement of fertilizers or the most effective application of newly developed concentrated fungicides and insecticides.

In conducting the research the Bureau does not operate large machine shops, or engage in expensive design operations. Usually the shop facilities of State experiment stations are used, and the work is concerned with adapting existing farm equipment to meet a new use, or to improve its operations. The research is concerned with establishing principles and requirements for effective operation and demonstrating to equipment manufacturers the possible market for an improved or new machine. The construction of a series of identical machines is not a part of the research job, but is the manufacturer's job. Completely new machines are built only after exhausting the possibilities of (*a*) making special adjustments on and adaptations of existing machines; (*b*) modifying and adding to existing machines; or (*c*) trying various combinations of existing machines or parts of such machines.

The following examples from the research of recent years illustrate the way in which the benefits of the findings of farm-equipment research reach farmers by way of equipment manufacturers:

1. Beet seed planter improved. USDA engineers cooperating with California and Colorado Agricultural Experiment Stations made intensive studies of seed plate design and other planter details affecting the accuracy of planting segmented and graded beet seeds. The data obtained was made available to all manufacturers for the improvement of their sugar-beet planting equipment.

2. Principles used in a tung nut huller developed by USDA engineers are being used in custom-built hullers being produced by a small local manufacturer.

3. The principles for using L. P. gas for curing cigar tobacco were developed by USDA engineers cooperating with the Connecticut Agricultural Experiment Station. As a result of this research commercial installations of this type were used for one-third of the production in the Connecticut Valley in 1951. Increased returns per acre of $500 resulting from improved quality and lowered costs are estimated.

4. A simple spraying rig to be used on a tractor cultivator permitting a dual spraying and cultivating operation has been developed by USDA engineers cooperating with the Mississippi Agricultural Experiment Station. Manufacturers have adopted basic principles of the rig in their designs, resulting in simpler and more effective sprayers. In some cases the retail price is only about half that of prewar models. It is estimated that 50,000 sprayers which incorporated this principle were sold in the Delta cotton area alone in 1951.

5. A precision feeder for row-crop dusters has been developed by USDA engineers. This feeder has been incorporated into the standard production model of one of the larger manufacturers of row-crop dusting machines.

6. Spray dispensing systems designed and evaluated for two major types of light aircraft by USDA engineers are the basis for most of the custom installations on such airplanes by local shops and custom operators and also for the factory installation of one airplane manufacturer.

7. Shields for tractor wheels to protect cotton plants were developed 4 years ago. They have been both farm-built and commercially manufactured by the thousands.

8. Principles used in a brush-type cotton stripper developed in cooperation with the Oklahoma Agricultural Experiment Station were incorporated in experimental models by three manufacturers in 1951.

9. A small electric milk pasteurizer utilizing a new pasteurization principle was developed by USDA engineers cooperating with the Connecticut Agricultural Experiment Station and is being produced by a manufacturer.

10. The basic principles for infrared brooding of chicks were developed by USDA engineers cooperating with the Virginia Agricultural Experiment Station. Twenty manufacturers are now producing equipment to mount and control infrared lamps for this use.

11. Improvements in design of electric traps for corn-borer moths and a new type of electric trap for tomato and tobacco horn worms are in commercial

production. These improvements were made in cooperation with the Indiana and North Carolina Agricultural Experiment Stations.

12. Electric-fan equipment for mow-curing of hay, based on performance specifications, developed by USDA engineers at Beltsville and in cooperation with the Virginia Agricultural Experiment Station, is being built and sold by at least six manufacturers.

13. Mechanical livestock-feeding equipment has been developed in cooperation with the Illinois Agricultural Experiment Station by assembling and modifying several pieces of equipment produced by different manufacturers. This labor-saving equipment, which is electrically controlled, conveys grains from the crib, proportions, grinds, and distributes to storage, wagon, or manger. One of the largest machinery manufacturers is now making a new feed grinder incorporating principles developed on this project. An electrical-equipment manufacturer is building the control devices, a conveyer manufacturer, the metering and materials-handling of equipment, and a fan manufacturer is supplying a fan specified for the equipment. Ten such assemblies are being placed on Illinois farms for pilot tests this spring.

NEED FOR IMPROVED GRASS SEED COMBINE

Dr. MOSEMAN. Perhaps Dr. McKibben, who is in charge of our agricultural engineering research, might wish to comment on this.

Dr. MCKIBBEN. I would like to refer again, Dr. Moseman, to a statement you made earlier in connection with the grass-seed situation. In many cases the industry is perhaps willing to go along with a machine that seems rather satisfactory, until somebody carries on some research which shows the seed loss that is occurring.

A very small improvement may mean a very large total return to American agriculture.

Senator THYE. Might I ask a question right there?

On just what type of machine have you done engineering work, and what is the nature of the design or changes in the machine? Have you worked on one specific type of combine?

Dr. MCKIBBEN. First, let me state that I have been connected with the Bureau only a short time. We have worked on a combine recently for the handling of peanuts.

Senator THYE. That is not grass seed.

Dr. MCKIBBEN. The grass-seed program is one we just started last fall. Exploratory tests indicate large losses of many grass seeds, from 25 percent up.

Senator THYE. You started talking about grass seed, and that is what led me to ask the specific question, as to what kind of combine you have done engineering work on, and what is the nature of the engineering that you have done?

That is what made me ask the question when you mentioned grass seed.

Then we get an answer on peanuts. That is a little different from grass seed.

Dr. MCKIBBEN. The grass-seed program is just being started.

Senator THYE. I wonder what kind of an engineering activity you have been engaged in in the grass seed. Have you gone to the specific manufacturer and taken a combine, we will say, a certain combine, and you have shown that manufacturer where the combine is improperly designed and that you would like to see him use another type, whether the difference is in a part of the cylinder or the seaparation, or the cleaning device? What is the nature of the engineering that was done there?

Dr. McKIBBEN. My statement is that the grass-seed program is one that is just being started. I started to use the peanut example because that is one on which we had been working.

Senator THYE. We know as to the grass-seed proposition there is a terrific loss, and we have had a scarcity of grass seed.

But there are several operations where you can charge the operator directly responsible for the loss of the seed, depending on how he himself handles the seed crop.

But I was interested to know the type of specific research that you have done on the machine to obtain a greater efficiency in the operation. That is the specific question to which I would like to get an answer. That is the only way we could understand where you are rendering a service to the manufacturer.

Dr. McKIBBEN. That is right, or I would say a service to the farmer as well as the manufacturer.

### MAKING FARM MACHINERY RESEARCH AVAILABLE TO MANUFACTURERS

Senator RUSSELL. What I am interested in is when you complete one of these projects, how does it get down to the farmer? Do you prevail on the manufacturer to make alterations?

Just taking something here at random, from your statement of what you have done, you state:

> Equipment and methods for controlling corn borer improved. In cooperation with the Maryland Agricultural Experiment Station, a new self-propelled corn sprayer was developed for spraying canning corn which met field requirements as to clearance, power, flexibility, stability, and range of adjustment. Detailed working drawings and specifications were made available to serve as a guide for further developments. In tests in Iowa, one nozzle per row proved to be as effective as two or more nozzles when spraying corn in the whorl stage of growth for control of first-generation borer.

If you have done all that, that is very significant. But how do you get the benefit of that to the farmer? Does the sprayer manufacturer incorporate those designs, or are you just using that to convey the idea of what the Maryland Agricultural Experiment Station is doing? Do the manufacturers pick up those improvements and incorporate them in their sprayers? How does it benefit the farmer?

The Department of Agriculture was established to give the manufacturing process and help the farmer to understand it. But I do not see where some manufacturer took that discovery and put it to work.

Has any manufacturer done it?

Dr. McKIBBEN. I will be glad to have the statement we are inserting in the record, in response to Senator Ferguson's request, show this information.

Senator FERGUSON. That is what I had in mind, Mr. Chairman, to try and get what they did and how it has been worked in the machinery.

Dr. McKIBBEN. Of course, we have an advisory committee from the equipment industry with whom our specialists are in contact.

In those areas where research is being done on a particular farm-machine problem, there will be field days during which machine developments are demonstrated.

Also, there are contacts with the implement companies in the particular field, who usually, as these changes in equipment are indicated, or as the requirements are proved, make use of this knowledge.

Fertilizer placement is one of the equipment developments that had been taken over quite extensively by the large implement companies. The fertilizer placement principles used on almost all corn planters is an outstanding example of an earlier machine development to which USDA engineers contributed and which has had general acceptance by equipment manufacturers.

Senator RUSSELL. Do you follow through to see whether or not the implement companies do anything about these discoveries? Do you bring it to their attention?

Dr. MCKIBBEN. Yes; certainly.

Senator RUSSELL. I wish you would refer to page 218 of the justifications and take item 3, "Equipment and methods for controlling corn borer improved";

Item 4, "Peanut harvesting equipment saves labor";

Item 5, "Equipment for harvesting and dehydrating sugar-beet tops help to provide good feed";

Item 6, "Sweetpotato digger improved and recommended for commercial production";

Item 7, "Special fiber production and processing equipment improved";

Item 8, "Fiber flax processing equipment studies accelerated";

Item 9, "Cotton-ginning processes developed";

Item 10, "A cottonseed dryer has been developed," and item 11, "Automatic feed mixer developed," I wish you would take those items, 3 to 11, inclusive, and file with this committee a statement as to which, if any, of those items have been commercially adapted and made available to the farmers.

Dr. MOSEMAN. Yes, Mr. Chairman.

(The material referred to follows:)

COMMERCIAL ADAPTATION OF EQUIPMENT RECENTLY DEVELOPED AND REPORTED TO THE CONGRESS IN ITEMS 3–11 OF EXPLANATORY NOTES, PAGES 218 AND 219

3. *Equipment and methods for controlling insects attacking canning corn.*—At the request of canning companies for spray equipment to insure better control of corn-ear worms and other insects, a high clearance sprayer has been developed in cooperation with the Maryland Agricultural Experiment Station for use on rough and hilly ground. A number of producers of large acreages of canning corn are having these sprayers built by custom shops using Bureau plans. Significant features of this sprayer are being used by 8 or 10 manufacturers.

4. *Peanut harvesting equipment saves labor.*—The Oilseed and Peanut Advisory Committee recommended that the Department develop improved equipment for harvesting peanuts. A peanut combine has been developed in cooperation with the Georgia Agricultural Experiment Station which greatly reduces harvesting labor. One company built a small number of preproduction peanut combines in 1951 which incorporated the principles developed in the Bureau research program.

Five or more manufacturers are developing attachments for converting grain combines to peanut harvesting combines in cooperation with the United States Department of Agriculture and Alabama Agricultural Experiment Station agricultural engineers.

5. *Equipment for harvesting and dehydrating sugar-beet tops.*—This work is still in the experimental stage.

6. *Sweetpotato digger improved and recommended for commercial production.*—Ten of these machines were built by a North Carolina manufacturer and sold to farmers for preproduction test during 1952.

7. *Special fiber production and processing equipment improved.*—Improved production and harvesting equipment is needed for the domestic production of special fibers such as sansevieria, ramie, and kenaf on a commercial scale. Such

equipment now has been developed and field tested. Commercial manufacture, however, depends on the expansion of acreage of these fiber crops which are of concern primarily in meeting defense or emergency needs. One of these equipment development, a fiber drier, promises to be of great value for the abacá production project in Central America, which is supported by Reconstruction Finance Corporation funds.

8. *Fiber flax processing equipment.*—Three items of equipment have been developed for the fiber flax industry:

(*a*) A new principle of multiple comb fiber flax deseeders developed by Bureau engineers is incorporated in all deseeders now used in Oregon flax mills. These deseeders are built by custom shops.

(*b*) The tow shaker which has been developed is used in all flax mills in Oregon. These shakers were built in custom shops.

(*c*) A drier, the principles of which have been developed on small model, is now being extended to mill size for commercial test.

9. *Cotton-ginning processes developed at Stoneville (Mississippi).*—(*a*) Lint cleaners: All six of the gin equipment manufacturers in the United States are manufacturing lint cleaners based on principles developed by BPISAE engineers. These cleaners are in use in more than 4,000 gins, process 3 to 4 million bales of cotton a year, and on the average improve cotton one-half grade.

(*b*) Two or more commercial firms are now manufacturing the recipro-cleaner, a low-cost cotton cleaner that removes three times more weight of motes and leaf trash than previous standard cleaners.

(*c*) Green boll remover: This device was developed in the Bureau's experimental gin and is now installed in a commercial gin for preproduction trials. It will undoubtedly be built by one or more commercial companies in the near future.

(*d*) Pneumatic unloader: This device reduces man-hours for unloading cottonseed 90 percent. It is assembled at each gin, using a commerial fan and ducts fabricated in place from raw construction materials.

10. *Cottonseed drier.*—This improved drier, developed at the Bureau's experimental gin, is now installed in a commercial gin for preproduction trials.

11. *Automatic feed mixer developed.*—An automatic feed mixer has been developed in cooperation with the Illinois Agricultural Experiment Station for delivering small grains and supplement to a feed grinder in predetermined ratios. Work on this machine has been in progress only 2 years, but an Illinois manufacturing company has made a small number of the metering devices and placed them on farms for preproduction testing.

### FARM-MACHINERY PATENTS

Senator FERGUSON. Might I inqurie: Do you get patents on these improvements and inventions?

Dr. MOSEMAN. We get public service patents on all patentable features of these improvements.

Senator FERGUSON. You get patents?

Dr. MOSEMAN. Yes.

Senator FERGUSON. Then you have an arrangement with the manufacturer if he takes over the patent. Can anyone manufacture them?

Dr. MOSEMAN. That is right. Those patents are what we call public-service patents; that is, they are retained by the Secretary of Agriculture for assignment.

Senator FERGUSON. But does he assign them to any manufacturer?

Dr. MOSEMAN. Yes.

Senator FERGUSON. So that, while it is a patent in the United States Government's hands, anyone can manufacture that improvement; is that correct?

Dr. MOSEMAN. That is right. Some of them have special license features, but the patent is controlled so that it is in the public interest. We are not giving any single company a monopolistic advantage of results of public-supported research.

Senator RUSSELL. That is an ordinary public patent where it is available to licensed people and the purpose of it is to prevent any one person from monopolizing the knowledge and running up the cost to the consumer; is that right?

Dr. MOSEMAN. That is right.

Senator RUSSELL. All right, sir; you may proceed.

### BUDGET REQUESTS LIMITED TO URGENT NEEDS

Dr. MOSEMAN. We have these four items of increase, Mr. Chairman, which we should like to discuss.

The first one is the increase for improving forage production in the South.

Secondly, we have an increase for developing methods for controlling halogeton and other noxious weeds.

Thirdly, we have an increase requested for funds for soil management research and soil surveys in reclamation areas.

Then, fourthly, we have an increase requested for fertilizer technology and evaluation work.

I can review each one of those items to the extent that your committee might wish.

Senator RUSSELL. You do not need to go into minute detail. We would like to know generally what you propose to do with that money, if you get it.

### INCREASE TO IMPROVE FORAGE PRODUCTION IN THE SOUTH

Dr. MOSEMAN. The first is for improved forage production in the South for which we are requesting an increase of $33,000. We feel the improvement of forage crops offers the greatest potential for increased food production in the United States. We are a meat-eating and milk-drinking people, and meat production is one of the major problems in our economy today.

Fifty-one percent of the nutrients for all classes of livestock comes from forage. Forage provides about 67 percent of the nutrients for dairy cows, 75 percent for beef cattle, and 90 percent for sheep.

We need adequate quantities of high-quality forage if we are going to meet our livestock product goals.

In the eastern half of the United States, east of the ninety-seventh meridian—that is a line along the western edge of Minnesota and on south—we have about 230 million acres of nonforested grasslands, most of which are unimproved.

Also, we have about 50 to 75 million acres of unused land in farms in the Southeast which have been abandoned because row-crop farming has been unprofitable on those soils.

These areas can be developed into profitable high-producing pastures. The long growing season, mild winters, and abundant rainfall give promise in that area of year-round grazing.

But while we talk about a potential of about 1,000 pounds of beef per acre, we have not reached that goal in very many cases.

The fact is that we have talked about the potentialities of the South for grasslands and the desirability of shifting to grassland agriculture in that area, but we have not given the farmers the know-how and the materials they need in order to get into that type of agriculture.

HIGH COST OF ESTABLISHING PASTURES

The cost of establishing improved pastures is too high. Often they have to reseed two or three times in order to establish a stand of grasses. The seed is expensive, and seeding rates are oftentimes two or three times higher than in other regions.

Senator RUSSELL. Why is that?

Dr. MOSEMAN. There are several factors, Senator. One is that we know we have to give greater attention to seedbed preparation and the placement of fertilizers. That is more critical under the soil and moisture conditions they have in the South.

In addition to that, we have quite a number of seedling diseases that attack the forage crops we are trying to grow in that area.

Probably the most significant problem, rests on the fact that we have not yet developed the disease-resistant, adapted types of grasses and legumes for the Southeast that we have for some of the other sections of the country.

If we recognize that a single species of grass or a single legume has the same kind of disease problems, the same kind of adaptation problems, that a crop like wheat has, we begin to appreciate the magnitude of the problem because each one of these grasses, each one of the legumes that we want to grow there has its separate disease and other hazards, and we should apply the same kind of plant-improvement program that we have in our grain crops.

FORAGE CROP DISEASE PROBLEMS IN THE SOUTH

Senator RUSSELL. Of course, using the native grasses, the forage crop is comparatively immune there. But has there been any particular disease that has attacked these grasses that have been adapted to the South, like the fescue? That is one that is particularly popular at the moment. Everyone wants fescue seed. The grass grows pretty well if you get the seed.

Dr. MOSEMAN. The difficulty with the fescue, Senator, is that it has certain leaf spots, which cut down its vigor and its yield. There are certain diseases that hit our legumes; crimson clover and ladino clover are rather badly damaged by crown rot which is an organism that attacks the crown of the plant and kills it off.

We have similar diseases that attack the young seedlings, that is, cause damping-off disease of the young seedling plants. And there is the bahia grass, which is one of the grasses that has become popular in the South. It is susceptible to ergot which causes abortion in cattle when they graze it.

Those are the types of problems that we are facing with forages in that area.

NATURAL GRASSES OF SOUTHEAST

Senator FERGUSON. What about the natural grasses there?

Dr. MOSEMAN. The forage grasses are the ones that we are working with, of course, in trying to develop the disease resistant strains that we can put into intensive production.

It is usually the case when you start concentrating a crop, whether it is a grass crop or anything else, in a cultivated pattern, where you are trying to increase the yield of the crop, that you run into disease

problems. That is true of the grasses as well as the cultivated crops.

Dr. MYERS. May I make a suggestion?

Dr. MOSEMAN. Yes.

Dr. MYERS. I think the Senator said natural grasses, which you may not have caught. None of the grasses or legumes which are in forage production in the Southeast are natural grasses in the sense of having been there originally; they are all introduced grasses.

The native grasses are poor in feeding quality and productivity, and none of them come into the improved pastures and forages in the South.

Senator RUSSELL. That is what I meant. I suppose I should have said indigenous. Bermuda I suppose was about the best grazing grass before the introduction of the clover and the lespedeza and kudzu and fescue and all the other very popular grasses down there now.

RESEARCH PROBLEMS RELATED TO FORAGE CROPS IN SOUTHEAST

Dr. MOSEMAN. We find that there is a combination of crop variety problems. These include the breeding of improved varieties, and learning how to manage them in mixtures of grasses and legumes to maintain the balance of species we will have to have in pastures there in order to extend the grazing season.

Along with that is the problem of soil management, attention to fertilizer requirements, not only for the young seedlings, but also the fertilizer practices to follow in the spring, summer, and fall, in order to maintain the productivity level throughout the year. In addition we need engineering research to develop improved equipment for seedbed preparation, fertilizer placement, and so forth.

Senator YOUNG. How much of an increase are you asking for this program?

Dr. MOSEMAN. A total of $33,000, of which $20,000 is for the plant side and $13,000 for the engineering.

Senator CORDON. That $33,000 is added to how much?

Dr. MOSEMAN. That is added to our base appropriation of $11,484,650.

CURRENT FUNDS AVAILABLE FOR YEAR-ROUND PASTURE RESEARCH IN SOUTH

Senator CORDON. How much more than $33,000 do you plan on allocating to this forage problem in the South?

Dr. MOSEMAN. We have about $80,000 total now.

Senator CORDON. Is that including the $33,000 or excluding it?

Dr. MOSEMAN. That is excluding the $33,000.

Senator CORDON. Will that be spent in cooperation with the State experiment stations?

Dr. MOSEMAN. In cooperation with the 11 Southeastern States in the program that we will develop jointly with them in order to concentrate on the most significant problems.

Senator CORDON. Do you mean that you have not yet developed a program?

Dr. MOSEMAN. We have developed a program. What I was referring to was the increased attention to these particular problems. We would use our funds on more important phases of the work that still remain to be done, as considered jointly by our bureau people and the State experiment stations.

PREVIOUS FORAGE CROP BREEDING RESEARCH

Senator CORDON. How long have you been engaged in this particular activity?

Dr. MOSEMAN. As far as the forage crop breeding work is concerned, it is one of the newest fields of work in plant improvement.

Senator CORDON. That means it is how many years old?

Dr. MOSEMAN. It started about 1935. It was around 17 years ago that we first started to breed, through hybridization and selection, improved forage crops.

Senator CORDON. Have you been engaged in this improvement of forage in these States for 17 years?

Dr. MOSEMAN. To a certain extent we have.

SEED-BED PREPARATION

Senator CORDON. And you have not yet worked out any kind of machinery for fixing up a seed bed.

Dr. MOSEMAN. We have not concentrated in the South on that problem at all.

Senator CORDON. A seed bed is a seed bed, is it not?

Dr. MOSEMAN. That is right. But farmers in the South want to know how to prepare a seed bed for insuring establishment of small seeded legumes and grasses, under their soil conditions, including steep slopes and low fertility with the varieties that we have now available for the South, that are subject to damping off and other diseases.

Senator CORDON. I am just talking about machinery to prepare it, not how you prepared it. I am just talking about the machinery. That is what you were discussing a while ago?

Does it take some peculiar machinery to take care of a seed bed in Georgia, or in Alabama that you could not use equally well in North Dakota or Washington?

Dr. MOSEMAN. It is a matter of trying to determine what the requirements are.

Senator CORDON. But you have now had 17 years to do it.

Dr. MOSEMAN. We have not been working on that problem.

Senator CORDON. But you had that many years to work on it had you desired to do it.

Dr. MOSEMAN. If we had the funds to do it, we could have done it.

Senator CORDON. That answer is given more often than any other before the Appropriations Committees of both Houses.

Senator THYE. It is not a leveling machine, is it?

Dr. MOSEMAN. No.

Senator THYE. You are not concerned with leveling the earth, you are not irrigating anything of that nature.

Dr. MOSEMAN. No.

Senator THYE. Therefore, it is a situation where you till the land.

Dr. MOSEMAN. Yes.

Senator THYE. Then the next think is to pack the land. So you either use a packer of one design or another in order to get a firm seed bed. Then it is just the application of the seed, and anybody engaged in planting grass seed knows you do not want to get that grass seed buried too deeply.

So it is just a question of getting a broadcast to lay the seed on top of the ground so as not to bury it to a depth so that the seed itself, even though it germinated, could not get through to the surface.

That, in itself, does not require a great deal of engineering, and you have been at it for some 17 years.

I think some good farmer down there could tell you all about it. I honestly believe that.

Dr. McKIBBEN. I believe the question raised by Dr. Moseman is that the records show a very large loss of seedlings.

Senator THYE. What is the cause of that?

Dr. McKIBBEN. That is what we are trying to find out.

Senator THYE. I will grant you it is not the machine that is the cause of it. You may get germination, but the plant may not survive the season; is not that right?

Dr. McKIBBEN. Senator, it is not contemplated here that we would have any new revolutionary machines, but there is the need for making a careful study of different combinations of these machines, which you have listed, for the different soil types and conditions.

And while Dr. Moseman suggests they have been studying the matter of forage for a good many years, that particular phase of establishing stands has not been explored carefully, particularly in this area where the soils are materially different from the areas in which improved pastures have been extensively used.

If I am wrong, you correct me, Dr. Moseman.

Senator CORDON. The first thing you do, if you are going to do it, is to get a seed bed. Then the first thing you would look at would be the equipment necessary to get it. Why have you not done that?

Senator THYE. I would just make a suggestion here, Mr. Chairman, that the most simple approach to it would be to go into a community and find a man that has successfully gotten a catch of grass and then just simply ask him how he did it and how did he prepare his seed bed and then go on from there.

You could do a lot of engineering here and you would be doing the research. You would be hunting your way through what some good, old farmer down there had known for the past 20 years.

Now, I am just giving you a simple positive suggestion here, because I have seen grasses obtained in dry years and I have seen them obtained when it was wet, and I have seen those that have wasted their grass seed for a period of 10 or 15 years, one after another, on the adjoining farm to the man that successfully got his grass seed catches.

It does not require a great deal of machinery research to find out how Mr. Jones has been successful in getting a grass stand year after year when Mr. Brown was not accomplishing it.

That is about as simple as the answer is. You cannot do too much research, in my humble opinion, in the type of machines for the preparation of a seed bed, because that is as old as history itself.

### PROPOSED RESEARCH PROGRAM

Mr. MOSEMAN. That is right, Senator. And what we plan to do under this program is not to develop a machine, but to take those many kinds of machines that are now available and see which combinations of the fewest number of them can be used economically in order to permit the farmer to establish the right kind of seed bed with the fer-

tilizer relationship and other requirements, that he needs to prevent damage when the young seedling emerges, and that sort of thing.

The difficulty we face in the southeastern area is that many of the places that have fine pastures established, have been established by people who had a lot of money, who could afford to gamble, and they did.

They spent $30 and $40 and $50 an acre to establish pastures. The small farmer cannot afford to do that sort of thing, and it is a matter of giving information to him as to the types of equipment, and the other practice he must follow as the minimum in labor and cost in order to get a good grass stand.

Senator RUSSELL. If the man spends as he should, he is a man who lives in town and is using that farm as a hobby. We have a great many of those out there. There seems to be some way to get certain advantages under these income tax laws that way, although I do not know exactly how.

But there are a lot of fellows in Atlanta who have bought big farms and they spend $40 and $50 an acre to seed them and they vie with one another to have the best grass in the area.

It is not a matter of making a living out of them, while the average fellow on the farm is out there to make a living. It is not a hobby with him, but is his business.

Senator FERGUSON. You are supposed to have some good farmers down there, are you not? I mean actually making a living off the farm?

Senator RUSSELL. Yes, we do. We are not too much on this forage business, though. Most of them make a living out of cotton, wheat, tobacco, peanuts, or corn.

Senator CORDON. This extensive forage is something relatively new.

Senator RUSSELL. Yes. I am frank to say I doubt if we have had the benefit of something like research in forage crops like other sections have had that have gone into those crops for a long period of years.

Dr. MOSEMAN. That is correct.

When I was answering Senator Cordon's question a while ago about the 17 years of forage crop breeding work I was referring to the work in the Midwest.

Senator CORDON. You should have available for your work in the Southeast all your experience that you have gotten in your work in all the other 37 States and add to that only what is necessary because of something peculiar to the area you are working in.

On that basis, in my thinking, you are on sound ground. There is no other answer that I can see to it.

### STATE COOPERATION IN PASTURE PROGRAM

Senator RUSSELL. Is there any contribution proposed on the part of the States for carrying out that work?

Dr. MOSEMAN. Yes. They are already tying into the limited work underway in the area now. As I mentioned earlier, we will develop this with them and take into account the facilities and personnel they can provide in determining just where we will go on this program.

We develop it cooperatively in the same way that we do other regional programs, with the States contributing their fair share to it.

CONTROL OF HALOGETON AND OTHER NOXIOUS WEEDS

Senator RUSSELL. What is your other new item here, Dr. Moseman?

Dr. MOSEMAN. The second one is the development of methods for controlling halogeton and other noxious weeds.

We have a map here prepared by the Bureau of Land Management, which shows the extent of the weed at the present time. It was first discovered in Nevada in about 1935.

About that same time, there was an independent infestation up in the Big Horn Valley of Wyoming and Montana. The gross area affected is about 400,000 acres in Wyoming and Montana and about 50,000,000 acres in Nevada, Utah, and Idaho.

Senator FERGUSON. Is that a new weed?

Dr. MOSEMAN. It has been known since about 1935.

Senator FERGUSON. I mean from 1935.

Dr. MOSEMAN. Yes.

Senator FERGUSON. Does it grow anywhere else in the world?

Dr. MOSEMAN. It came in, so far as we can tell, from an area around the Caspian Sea. We don't know just how it got here, but we think it was introduced with some crop seeds.

While the area here is fairly large, the most significant thing is the way the weed has been spreading into the different new areas. It is moved from one location to another on road machinery, trucks, and equipment of different kinds.

Last fall there was provided to the Bureau of Land Management of the Department of the Interior a rather sizable fund, $2,300,000, for control operations, which indicates the recognized seriousness of the problem.

Senator FERGUSON. Do you know how to kill it?

Dr. MOSEMAN. We don't know how to kill it under all conditions, Senator. There is one way to hold it in check, and that is to reestablish competitive grasses. Crested wheat grass is one that can be established, and once established, it will tend to hold the weed in check.

PROGRAM RELATIONS WITH BUREAU OF LAND MANAGEMENT

Senator RUSSELL. What sort of assistance do you get from the $2,300,000?

Dr. MOSEMAN. We do not get any assistance from those funds which you provided to the Department of Interior agencies for control operations. They are concentrating on that reseeding job. They feel there are extensive areas where they can reestablish crested wheat grass over the next 2 or 3 years fairly effectively, and they are using the funds they have for that.

Senator RUSSELL. The crested wheat grass will cost you infinitely more than that for that area you have there. I have had some experience with that, with reseeding ranges, in this committee, and I will say you could not reseed all that for $100,000,000.

Senator CORDON. As a matter of fact, that outline that represents the exterior boundaries of the area within which in a few isolated instances they have found halogeton; is that correct?

Dr. MOSEMAN. That is right. It does not occupy the whole area at all.

As Senator Cordon points out, this map shows the gross area, and within that you have concentrated patches of infestation of the weed.

CONTROL BY RESEEDING COMPETITIVE GRASSES

Senator CORDON. Your livestock, particularly sheep, and that sort of thing, would benefit from the reseeding; is that correct?

Dr. MOSEMAN. That is correct.

Senator CORDON. When you plant competitive grasses, all you are doing is furnishing forage for the animals, and you are furnishing forage in place of halogeton.

Dr. MOSEMAN. That is a significant feature of the problem. The animals go to halogeton when other grasses are not available.

Of course, many of the ranchers are steering away from the halogeton infested range, and are using other noninfested range lands much more heavily, which means they are overgrazing some of these other areas.

It is into these overgrazed areas that halogeton moves and takes over. So it is a rather vicious circle.

PROPOSED RESEARCH ON CONTROL WITH HERBICIDES

Senator YOUNG. Can it be killed by spraying?

Dr. MOSEMAN. We haven't had much research on that. That is primarily what our request for funds is to provide. That is for research on herbicides and studies to determine where the plant grows, when we might best hit it with chemical sprays, or how else we can eradicate it.

Senator CORDON. If there is a known method to do the job for less, if there is any other method that could be applied, in view of the very critical situation where you have to move into it immediately, I would say that we should have put the $2,300,000 into that in the first place.

Senator YOUNG. What will you do, for example, if you find just a small new area? Have you attempted to eradicate such spots?

Dr. MOSEMAN. Yes. We can control that with chemicals. The difficulty with our present chemicals is that they are not selective for halogeton, and if we spray wide areas with such chemicals we kill not only halogeton, but other herbage which would normally help to hold the halogeton in check.

The desirable plants are killed as well as the weeds.

Senator CORDON. Cannot you plant something there afterwards?

Dr. MOSEMAN. You can where the rainfall is high enough, say 8 to 10 inches, so that you can get crested wheat grass started. But in some of the areas where rainfall is much lower than that, we have a real problem and we just don't know the answer yet. We don't know how we can establish grasses in those areas.

Senator FERGUSON. What are they doing around the Caspian Sea area?

Dr. MOSEMAN. We don't have much information on that, in that area. We don't know how much of a problem it is really.

Senator FERGUSON. Does the plant have any value?

Dr. MOSEMAN. No, not that we know of. The plant is similar to the Russian thistle. The only difference is that it has these oxalates which are toxic to animals.

Senator RUSSELL. Has anybody tried cutting this weed early enough before it matures, or is there some acidity or chemical composition that makes it dangerous?

Dr. MOSEMAN. It is a range plant, Senator. It is not one that you can harvest very well except as cattle get to it in grazing.

CONTROL PROGRAM OF BUREAU OF LAND MANAGEMENT

Senator RUSSELL. The $2,300,000 for control was just the down payment, I suppose.

Dr. MOSEMAN. That was to initiate the control program and was concentrated primarily by the Bureau of Land Management on the public lands under their supervision, since that is one source of supply of the seed and the spread of the weed, and therefore there is an obligation on the part of the Government to assist in the control of it.

Senator RUSSELL. Have you seen the estimate of what would be the total cost of controlling it on the public lands?

Dr. MOSEMAN. No, I have not. The Bureau of Land Management has again this year a request, I think, for $1,345,000.

Senator CORDON. Mr. Chairman, have any figures been given to the subcommittee with respect to the total cost?

Senator FERGUSON. How much was spent of that $2,300,000 up to date? How much has been spent?

Dr. MOSEMAN. I cannot say what has been spent up to date.

Senator FERGUSON. Could not they give us a report on what was spent and what the results were?

Dr. MOSEMAN. I am sure they can.

The point I was going to make is that they are contracting for a lot of the reseeding work. They expect to utilize the full two million dollars by the end of the fiscal year for such contracting operations on reseeding.

Senator RUSSELL. The Interior Department spends that, you do not spend it; is that correct?

Dr. MOSEMAN. That is right, they spend it.

FUNDS REQUIRED FOR PROPOSED PROGRAM

Senator RUSSELL. You estimate $40,000 for that work, do you not?

Dr. MOSEMAN. Yes.

Senator RUSSELL. You hope to find some means, if you carry on that work long enough, to kill this plant by some means or other, by poisoning it or dealing with it in someway to eradicate it; is that correct?

Dr. MOSEMAN. We are going to concentrate primarily on chemicals to see if we cannot develop or find selective chemicals that will control the weed in watering places and areas that are disturbed, where the weed flourishes and provides a source of seed supply for spread to other areas.

In doing that, we will, of course, have to study how the plant reacts to different moisture conditions and seasonal conditions so that we can find the time of the year when we can use the right chemical to kill it.

That is one of the most important questions in the successful use of chemical weed killers.

Senator CORDON. Have the agricultural experiment stations of Nevada, Utah, Idaho, or Wyoming, have any of them made any studies in this field?

Dr. MOSEMAN. Yes; they have. The Utah station had some added appropriations this past year from its legislature to concentrate on it.

Senator CORDON. You know, a great many stockmen in the area out there deny that this is any kind of a crisis.

Dr. MOSEMAN. There is a lot of difference of opinion on it; there is no question about that. Some of the folks tend to minimize it; others feel it is one of the most serious things that they have faced out there.

### TOXIC PROPERTIES OF HALOGETON

Senator FERGUSON. Have you any real evidence that it does kill animals?

Dr. MOSEMAN. Yes. There was one flock of sheep of about 1,600 head out in the Raft River Valley of Idaho that was completely wiped out.

Senator FERGUSON. What evidence have you that it was because of this weed?

Dr. MOSEMAN. They have traced it down and found the death of those animals was due to the oxalate or poison that this weed contains.

Senator FERGUSON. Was there any other evidence?

Dr. MOSEMAN. They have also made some feeding tests. The Bureau of Animal Industry in the Department has made feeding tests and they have found that, I believe, for cattle, about a third of a pound of dry weight of halogeton per hundred pounds of live weight livestock is enough to make a fatal dose.

In sheep, 2 or 3 pounds of the weed can be fatal if the poison content of the weed is high.

Senator YOUNG. When these losses have occurred, were the other grasses short?

Dr. MOSEMAN. Pretty largely when the ranges were short and the stock moved into these areas that are infested with the poisonous weed.

Senator YOUNG. They had nothing else to eat?

Dr. MOSEMAN. That is right.

Senator CORDON. That is the only time they will eat it, is it not?

Dr. MOSEMAN. I don't know if it is palatable to them otherwise, or not.

Senator CORDON. The Bureau of Land Management informs that sheep will not eat it if there is anything else in the way of forage.

Dr. MOSEMAN. They pretty well starve before they eat it; that is right.

Senator RUSSELL. If there is nothing further on that item, we will proceed to your next item.

### SOIL SURVEYS AND SOIL MANAGEMENT, IRRIGATION, AND SALINITY INVESTIGATIONS IN RECLAMATION AREAS

Dr. MOSEMAN. The third increase is for soil surveys and soil management, irrigation, and salinity investigations in reclamation areas.

This is a part of an increase for three different agencies of the Department, and was developed as a result of joint consideration by the Bureau of Reclamation and the Department of Agriculture.

This review was initiated by an exchange of correspondence between Secretary Brannan and Secretary Chapman, and the Department has considered the needs of the Reclamation Service for research, economic investigations, and services as related to reclamation developmental plans for future years.

Of the increases that have been requested, this Bureau is requesting $125,000 to provide for the soil surveys and the work on soil management and salinity control.

Senator THYE. Doctor, of that increase of $125,000, how much is expended as the total amount for that particularly?

Dr. MOSEMAN. At the present time, we have about $480,000 for soil surveys and for the soil management work in reclamation areas; about 50 percent of that for each program.

Senator CORDON. What were the two programs?

Dr. MOSEMAN. For soil survey work, and then for soil management work.

Senator FERGUSON. Is not this along the same line?

Dr. MOSEMAN. It is along the same line. You folks know we had an increase about 1945 for work in the Columbia Basin area to do this same type of job. We did the research work out there pretty well ahead of the developmental program.

Senator CORDON. You can do it yet and still be pretty well ahead of it.

Dr. MOSEMAN. That is probably right.

COORDINATION WITH BUREAU OF RECLAMATION

Senator FERGUSON. Why was this not done as part of the reclamation project?

Dr. MOSEMAN. It is a case where they recognize, and I think we also feel, that the Department of Agriculture has the responsibility for doing the agricultural research.

Senator FERGUSON. But here you go ahead and make your reclamation, and, as indicated here, the people had to abandon 500,000 acres of irrigated land.

How would you irrigate it without knowing these problems? Why should the money be expended by the Federal Government and ultimately by the farmers?

Dr. MOSEMAN. That is right, and it is this situation we are trying to catch up on.

Senator FERGUSON. Why was it not taken care of? How did we get into this thing of allowing the irrigation of land that was not of any value?

Dr. PARKER. Might I comment on that?

Senator FERGUSON. Yes.

Dr. PARKER. Irrigation in the West has been developed by the Bureau of Reclamation and the Department of the Interior. They are not a research agency and have studiously refrained from conducting agricultural research, which is the responsibility of this Department and the State agricultural experiment stations.

Senator FERGUSON. Why did not your Department years ago come up and say "You people are appropriating money for irrigation, and there is grave doubt that they will be able to use the land that is going to be irrigated"?

Dr. PARKER. I think the record will show we have been up here a good many times and made essentially that statement.

Senator FERGUSON. I wish you would find it in the record and point it out.

Dr. PARKER. All right, sir.

(The material requested follows:)

*I. Increases requested since 1939 for soil management investigations in reclamation areas*

[NOTE—Items marked with an asterisk (*) relate primarily to soil management studies in areas being opened for irrigation. Other items relate to investigations in reclamation areas generally, including those which had been settled]

| Year | Item | Bureau estimate | Department estimate | Budget estimate | Appropriation |
|---|---|---|---|---|---|
| 1953 | *Expand soil management and salinity investigations required for Bureau of Reclamation projects | $200,000 | $81,200 | $75,000 | |
| 1952 | To expand soil improvement, management, and irrigation investigations as part of Department research program on soil and water management and conservation | [1] 250,000 | 60,000 | | |
| 1951 | *Water, soil, and plant relationships in crop production on irrigated lands of Missouri Basin | 239,000 | | | |
| 1950 | For the initiation of cooperative investigations in soil management for crop production in the Tucumcari, N. Mex., irrigation project (and other areas) | 140,000 | 22,700 | 22,000 | $22,000 |
| | *Accelerated programs (of soil management investigations) for lands to be irrigated under Missouri Basin development programs | 375,000 | 375,000 | 100,000 | 66,000 |
| 1949 | *To expand soil management investigations on newly irrigated lands in the lower Colorado and Columbia Basin projects | 80,000 | 80,000 | 80,000 | |
| 1946 | To study irrigated soils to determine causes of declining yields and abandonment | 170,000 | 151,300 | | |
| | *To obtain information to prevent failure and to insure permanency of production on newly irrigated lands of the lower Colorado and Columbia Basins | 150,000 | 133,700 | 133,660 | 133,660 |
| 1943 | Irrigation and water requirements of crop plants | 70,000 | 70,000 | | |
| 1942 | Crop production investigation under irrigation | 18,980 | 10,000 | | |
| | Quality of irrigation and drainage waters | 15,000 | | | |
| 1941 | Crop production investigations under irrigation | 10,000 | 10,000 | | |

[1] Includes provision for investigations in dry-land and humid areas.

*II. Increases requested since 1939 for soil surveys on reclamation areas*

[NOTE.—Items marked with an asterisk (*) relate primarily to soil surveys in areas proposed for irrigation by the Bureau of Reclamation. Other items relate to the national soil survey program, part of which would have been for reclamation areas]

| Year | Item | Bureau estimate | Department estimate | Budget estimate | Appropriation |
|---|---|---|---|---|---|
| 1953 | *Preparation of detailed basic soil surveys and maps in areas where reclamation programs are authorized | $250,000 | $51,200 | $50,000 | |
| 1952 | Expand soil survey program to speed-up the preparation of soil surveys outside the Missouri River Basin | 250,000 | 75,000 | | |
| 1951 | *To accelerate basic soil surveys urgently needed by State and Federal agencies including Bureau of Reclamation (Missouri River Basin) | 200,000 | | | |
| | To expand regular soil survey and map production as part of a national soil survey program | 350,000 | 150,000 | 150,000 | $37,500 |
| 1950 | *To accelerate basic soil survey program primarily on lands to be irrigated in the Missouri Basin development program | 241,000 | 241,000 | 200,000 | 150,000 |
| 1949 | To meet Federal responsibility for increased participation in the national cooperative soil survey program | 145,000 | | | |
| 1948 | *Soil classification and mapping in the Missouri River Basin | 200,000 | 143,500 | | |
| 1947 | Soil classification and preparation of soil maps in the national cooperative soil survey program | 370,000 | 411,500 | 400,000 | 300,000 |
| 1943 | Investigation, classification and mapping of soils | 300,000 | 300,000 | | |
| 1942 | Soil survey | 300,000 | 300,000 | | |
| 1941 | do | 100,000 | 80,000 | | |
| 1940 | do | 400,000 | 99,992 | | |

RECLAMATION PROGRAM AREAS

Senator YOUNG. The Bureau of Reclamation is carrying on some experiments of its own, is it not?

Dr. PARKER. No, sir; not what they term research. They have development farms in several areas including the Columbia and Missouri River Basins. We are participating with them in the research. They are operating the farm and carrying part of the expense.

Senator YOUNG. Do you furnish your own funds?

Dr. PARKER. Yes, sir; we furnish our own funds.

In the Missouri Basin last year, for example, we surveyed about 400,000 acres. The program was planned with the Bureau of Reclamation as to the areas that they wanted to survey, but it was only since 1945 that we have had the adequate cooperation between the program of the Bureau of Reclamation and the program of the Department of Agriculture together.

Senator FERGUSON. But how did we ever allow land to be irrigated and the tests not taken of the soil so that you would know whether or not it could be used?

Dr. PARKER. I cannot answer how that happened through the processes of program development and congressional authorization.

Senator FERGUSON. Now we find you saying that there were 500,000 acres irrigated that are of no value and you want to go back and see if you can make them of some value.

Dr. PARKER. No, sir.

Seantor FERGUSON. What do you want to do?

Dr. MOSEMAN. It is not in the old areas, Senator. We are working with them on some of their projected reclamation areas, the new ones they are going to move into, and our research is planned to prevent that same type of mistake.

Senator FERGUSON. You say "these areas," meaning the areas that have been abandoned; is that not right?

Look at the bottom of page 198 of the justifications. You say:

> On much of the land now irrigated in the West, crop yields have been reduced from 10 to 20 percent due to salinity, in excess of soluble salts in the soil * * *.

Did you not know the salts were in the soil and that this would happen?

Then you go on—

> * * * a part of the increase is requested to permit the expansion of the Bureau's salinity investigations to the most critical of these areas.

Dr. MOSEMAN. What we are concentrating on under this research program, Senator, are these new areas where the Bureau of Reclamation has planned projects where we want to do the soil survey work and other soil management work before they go ahead with their program.

Senator FERGUSON. All this money is for new areas, so that we will not get into this kind of situation again; is that right?

Dr. MOSEMAN. That is right.

Senator CORDON. That is not in accordance with the justification at all.

Dr. MOSEMAN. This wording apparently is not clear.

Senator CORDON. You have separate subheadings for soil surveys, and you have salinity investigations in places where the salinity itself has appeared and you are going to determine how to get rid of it.

If we believe what you have printed in here, that is how it is. I certainly do not want to feel you have that in here for any other purpose.

Dr. MOSEMAN. The salinity problem is one that we can expect in the new areas on the basis of experience in the old areas. That is the kind of thing we want to work on in the new projected areas, to develop salinity control measures in those areas. The results of these salinity control studies will, of course, be helpful in attempts to reclaim some of the old irrigated lands abandoned because of salinity.

### DETERMINING SUITABILITY OF LAND FOR IRRIGATION

Senator YOUNG. Was it your determination or the determination of the Bureau of Reclamation with respect to the Missouri-Souris project, that several hundred thousand acres were not irrigable?

Dr. MOSEMAN. I believe Dr. Parker might give you the answer on that.

Dr. PARKER. That was the final determination made by the Board of Review of the Bureau of Reclamation. But we participated in the investigations, gave them the results of our work, and it was partially as a result of the findings that we helped develop that the Review Board decided that the area was not irrigable.

Senator YOUNG. Did your department agree with the conclusions of the Bureau of Reclamation on this Missouri-Souris project?

Dr. PARKER. Yes, sir. I think the Board of Review of the Bureau of Reclamation reached a sound conclusion.

Senator YOUNG. Mr. Sloan disagreed with you; did he not?

Dr. PARKER. Yes; I understand Mr. Sloan disagreed.

### LOCATION OF PROPOSED RESEARCH

These increased funds, gentlemen, are for three specific lines of work.

First is the Riverton area in Wyoming. The work there involves doubling the area for irrigation. There are a good many problems of salinity and drainage in that area.

In December 1949, President Humphries, of the University of Wyoming, called a conference of the Bureau of Reclamation, the Department of Agriculture, and the Wyoming station. They planned jointly what should be done. It was agreed that the various agencies would ask for funds.

The Bureau of Reclamation has made available a development farm in the area to implement the agreed research and development project.

The second is for work in the central Snake area of Idaho. There are about 250,000 acres of what they call slick spot land there, on which we have done a very small amount of research in the last 2 years and have a program planned with the Idaho station, with the Bureau of Reclamation. Part of these funds would go for that purpose.

Senator YOUNG. How do you determine how much of the funds in the particular project the Bureau contributed and you contributed?

Dr. PARKER. The Bureau has adopted the policy of making the land available to us, providing the water, and doing a portion of the labor. If they develop a farm of 160 acres, they make available 20 or 30 acres for the research work. They have a man on the place. These facilities are made available to the research people without any charge.

We put a man on the place to look after our detailed experiments. Our scientific staff would be headquartered at an established field or experiment station. In North Dakota it is headquartered at the Mandan station.

CURRENT PROGRAM OF WORK

Senator CORDON. Have you carried on the work for a number of years?

Dr. PARKER. Not at either one of these locations.

Senator CORDON. At some other location?

Dr. PARKER. Yes, sir. The most extensive work is in the Columbia Basin, the northern part of the Missouri Basin, and the lower Colorado.

Senator CORDON. You know, of course, that over a period of years the Department of the Interior has come back to the Congress with a list of its former errors and has asked for modification of irrigation contracts to permit the water users to work out their salvation on some more generous basis than the original contract.

In connection with that, there have been salinity surveys among others. Did you participate in those from time to time?

Dr. PARKER. We may have helped some. I don't know specifically the ones to which you have reference.

Senator CORDON. There have been several of them in the Riverton area.

I know there have been projects in Wyoming; some in Colorado, some in my State of Oregon, scattered pretty well over the West.

I know that on one or two occasions Congress extended the repayment time for 200 years on the basis that the Government went in where it should not have gone.

NEED FOR RESEARCH IN ADVANCE OF DEVELOPMENT

Dr. PARKER. The characteristic has been that there has not been research in advance of the development. It has come after the problem has arisen. Then they come to the research people and say, "All right, what is the trouble and what can we do about it?"

The purpose of these funds is to handle the research along with the development, or in advance.

I think, Senator Young, the Missouri-Souris is a good example.

Senator YOUNG. The committee you have now was set up through the efforts of Mr. Sloan.

Dr. PARKER. That is right. After the evidence has been developed, you can evaluate the evidence and estimate the difficulties that will be encountered.

Senator CORDON. When you make a preproject investigation, when you make the investigation of the soil before there is any request from the Congress for money for the reclamation project, have you had experiences where you recommended against the project, but, nevertheless, the Interior Department went forward with it?

Dr. PARKER. We have never been called upon to make a recommendation in advance of the commitment upon the part of Congress.

Senator CORDON. You never have?

Dr. PARKER. We never have, as far as I know. The Department and the University of California have made soil surveys in southern California for the primary purpose of determining the irrigability of certain areas. Currently the Department and the Utah agricultural experiment station are conducting investigations with the cooperation of the Bureau of Reclamation to determine the feasibility of irrigation in the Weber Basin, Utah.

Senator CORDON. I read here that soil surveys of proposed reclamation projects are needed to aid in the determination of areas where successful projects irrigation is likely. What does that mean?

Dr. PARKER. They have not been generally furnished in the past. There was no provision for them.

Senator CORDON. Then your paragraph on soil survey here is not relevant to what we are inquiring about. You are not going to do it, either?

Dr. PARKER. We would do it if we had the funds.

Senator CORDON. And if you were asked?

Dr. PARKER. And if we were asked.

Senator CORDON. Have you been asked?

Dr. PARKER. Yes, sir. We have been asked by the Bureau of Reclamation to help them on specfic areas which they have planned for development.

Senator RUSSELL. It seems to me, as one that does not know a great deal from first-hand experience on these reclamation projects, that that is the way it ought to be run all the time. You should make an investigation before the Congress appropriated these large sums to build these dams and install these waterways.

Dr. PARKER. We agree with you completly, Senator.

### REQUESTS BY BUREAU OF RECLAMATION FOR RESEARCH AND SURVEYS

Senator YOUNG. Since when has the Bureau of Reclamation made the requests for the department to investigate before the construction of irrigation projects? It has not been the practice for very many years, has it?

Dr. PARKER. No.

Senator YOUNG. When did the practice commence?

Dr. PARKER. The first real approach to this, as far as I know—and I have been in the Department now about 10 years—was in 1945 and was related to the development of the Columbia Basin.

The Bureau of Reclamation recognized that there were problems there. The general decision had been made that the Columbia Basin was to be irrigated, but there was still plenty of time to choose which acres might be irrigated and the nature of the problems on them. So that it was in 1945 that we first made this type of approach.

And I think, Senator Young, this is the first time, to my knowledge, that the Secretaries of the Interior and Agriculture have jointly said, "All right, let us look at our programs together, or the Bureau of Reclamation programs, and decide what Agriculture ought to have to implement it."

Senator CORDON. It is long overdue.

I have one question, Mr. Chairman, finally.

Senator RUSSELL. Very well.

### CENTRAL SNAKE RIVER PROJECT

Senator CORDON. On page 198, Doctor, you refer to the Central Snake River project, which you say embraces the potential development of some 1,035,000 acres of new land and supplemental water for 485,000 acres now irrigated, but with an inadequate water supply.

Does that figure of 1,035,000 acres include what is known in Idaho as the Mountain Home project?

Dr. PARKER. I think it does. That is the Bureau of Reclamation's over-all figure for that area, and I believe it includes the Mountain Home project.

And the Mountain Home project, like the Black Canyon and part of the Boise project and the Owyhee in Oregon have some real problem soils.

Senator CORDON. I recall a year or two ago going over that particular project. My memory now is that they expected to have to spend some thousand dollars an acre to reclaim the land. I would like to hope that the Department of Agriculture would pass upon the feasibility of that sort of expenditure before the committee.

### JOINT APPROACH TO PROBLEM BY AGRICULTURE AND INTERIOR

Dr. PARKER. I think, Senator Russell, that this represents a type of joint approach by the Department of Agriculture and the Department of the Interior that, as Senator Cordon says, is long overdue and that it merits the close support of the Congress.

Senator RUSSELL. A great many of us are not from the irrigated areas and know little about it, but are in favor of any sensible program that will bring new acreage into production in this country.

We have over the years wanted planning on these projects. They come down here for appropriations with a fine project and everything is wonderful and we are going to liquidate this within the limitations, of course.

Then the Congress gives them the money and you see the same fellow back here, or his successor, in about 6 years saying that "We made some miscalculation", and they want a change in time on it or a reduction in the payments.

At one time we passed legislation that practically wiped out the payments to be made on a number of these projects.

That has been rather disconcerting to those of us who do not live immediately adjacent to the projects. We have seen that apparently there was very poor management somewhere along the line in the planning and in the construction and operation of these irrigation projects.

Dr. PARKER. That is bad enough, but it was worse for the first farmers who went on the project and got wiped out.

Senator RUSSELL. Yes, I guess the individuals were worse off.

If there are no further questions, you may go ahead with your next item.

FERTILIZER TECHNOLOGY AND EVALUATION INVESTIGATIONS

Dr. MOSEMAN. We have one last item here, on fertilizer technology and evaluation investigations, an increase of $350,000.

This increase relates to certain developments of the Atomic Energy Commission and their program to recover uranium from phosphate rock.

The Chairman of the Atomic Energy Commission addressed a letter about a year ago to the Secretary indicating that a major source of uranium in this country is in phosphate rock and he asked the Department to assist them in working on problems associated with that particular development.

We had been working with the Atomic Energy Commission for 2 years previous to that time in guiding them in this particular developmental program.

The kind of information they wanted was to learn the ultimate requirements for phosphate in agriculture since this would be a direct guide to them in determining the uranium that might be extracted as a byproduct.

Also, they wanted information regarding the whole phosphate fertilizer industry, including a summary of the processes that are used, the grades of rock that are used, and so on.

Our request here, of $350,000, is directly related to the planned program of the Atomic Energy Commission to recover uranium.

Senator YOUNG. Are they furnishing any part of the funds?

Dr. MOSEMAN. No, not for this program. They feel it is an agricultural job. It is tied into the use of phosphate as fertilizers. And as a result of their extraction process, there will be high analysis materials that will be difficult to handle from the formulation, physical property, ammoniation, and other standpoints.

Senator CORDON. Is there phosphate rock in the Colorado deposit?

Dr. MOSEMAN. I don't know that they are going to use Colorado deposits.

Dr. PARKER. The western deposits in Montana and Idaho will be used.

COOPERATION WITH TVA

Dr. MOSEMAN. With the higher analysis materials, there is a job that must be done in the formulation, development of the physical properties, including granulation, so that these materials can be handled.

During the war, when our Bureau was moved to Beltsville, we were not able to move our pilot-plant facilities for doing this type of research work. So, we have explored with the Tennessee Valley Authority the possibility of joint use of their facilities at Muscle Shoals. They have pilot-plant facilities there, but we do need funds to provide chemical engineers, technicians, and assistants to handle that particular research problem. We have already developed with the Tennessee Valley Authority one cooperative project to study acidulation of phosphate rock with mixtures of sulfuric and phosphoric acid. We are now jointly considering with them other projects that tie into their responsibility and our responsibility in the fertilizer-research field.

The Bureau of the Budget has given special attention to this proposal. They have explored the Tennessee Valley Authority situation, their responsibilities as well as ours. The Budget Bureau has been active in sponsoring conferences between the Department, AEC, and Tennessee Valley Authority to work out the most satisfactory relationship. We feel that we can develop the kind of cooperative program, using TVA facilities and Department personnel and facilities, that will enable us to do this job as economically as possible.

Senator RUSSELL. What has the Atomic Energy Commission contributed to it?

Dr. MOSEMAN. They are not contributing anything financially, Senator. They feel this is primarily an agricultural problem.

### INDUSTRY COOPERATION

Senator CORDON. What are the 81 companies with 202 plants contributing? I think that is the big question here. If this high-analysis phosphate is going to run them out of business, they should be willing to make some slight contribution.

Dr. PARKER. The industry is already making a substantial contribution, Senator Cordon. There has been some experimental work by industrial concerns in cooperation with the Department.

There are further experiments planned, so that we feel that industry is cooperating very satisfactorily.

Senator CORDON. I think they could cooperate for a good share of the $350,000 which you need here if there actually is the danger you indicate here that their plants might have to close because they are not geared to the use of these higher-analysis materials.

Dr. MOSEMAN. Part of this increase, Senator, also is for the evaluation of these materials under farm or field conditions.

Senator CORDON. What part?

Dr. MOSEMAN. $150,000.

Senator CORDON. Then $200,000 is for this particular job; is it?

Dr. MOSEMAN. Yes.

Senator CORDON. At least you could expect the industry to furnish half of it. It seems to me they should be vitally interested.

Dr. PARKER. It is safe to say that industry is putting in far more than a half million dollars.

Senator CORDON. Perhaps they are putting in enough so that you do not have to put in any.

Dr. PARKER. This was planned with a rather complete knowledge of what industry is doing.

Senator CORDON. What is industry doing, if you have that complete knowledge?

Dr. PARKER. Industry is doing quite a lot on the use of mixed acids and improvd processes.

### ATOMIC ENERGY COMMISSION INTEREST IN PROJECT

Senator CORDON. I am speaking about this problem that is going to be created here by reason of the action of the Atomic Energy Commission.

What is the Atomic Energy Commission doing to protect itself?

Dr. PARKER. They are already working and have conducted experiments, in which we have cooperated, to utilize the products that would come out of the uranium-recovery program.

Senator CORDON. If they are going to do the job, need you do it? They are competent; are they not? That is their business.

Dr. PARKER. They are competent, and there are some things they can do better than we can do, and there are some things we can do considerably better than they can do.

So, we feel the best thing to do is to have a joint program.

There is one very important point about it. The large industrial concern tends to do its own work and keep developments for its own use, and it is part of the responsibility of the Department of Agriculture to see that the farm cooperatives who do not have a large research program, who make about 15 percent of the fertilizer of the United States, that they are protected and likewise the small manufacturer who is not able to carry along an adequate research program of his own.

### PROGRAM WILL AID FARMER AND SMALL FERTILIZER COMPANY

There are about 8 to 12 large fertilizer concerns in the United States, but the total number is more than a hundred. The department's program helps serve the smaller companies and does not encourage the centralization of the fertilizer industry into a few hands.

Senator CORDON. Eighty percent of your phosphorus, commercial fertilizer, you say, is manufactured by 81 companies in 202 plants.

Dr. PARKER. That is right.

Senator CORDON. Are we to understand now that those 81 companies can take care of themselves?

Dr. PARKER. I don't think they can; no, sir. There are about seven or eight large companies that will take care of themselves pretty well, but they are concerned primarily with taking care of themselves.

### NATURE OF RESEARCH WORK

Senator THYE. May I ask: What is the specific type of research that you propose to carry out?

Dr. PARKER. One of the products that would come from uranium-recovery process would be high-analysis phosphates. It might be in the form of liquid phosphoric acid, or it might be in the form of triple superphosphate.

Senator THYE. Have you a pilot-plant research project under way now, or do you propose to establish that?

Dr. PARKER. We propose to establish that along with the Tennessee Valley Authority, jointly.

Senator CORDON. They have a pilot plant, do they not?

Dr. PARKER. They have pilot-plant facilities; yes, sir.

Then we would undertake the steps that are involved in formulating these into producing high-analysis mixed fertilizers in a granular form, and that involves a number of steps, including preparation of material as to size, its agglomeration, its ammoniation, finally, the production of the granule and its evaluation in the field.

This program, if implemented, would, in my judgment, reduce the cost of plant nutrients on the farm in the neighborhood of 10 to 15 percent. I can illustrate that by one example. In the case of tobacco

fertilizers, throughout Virginia, the Carolinas, and Georgia, the common grade is a 3–9–6, used at the rate of about 1,200 pounds per acre.

We are confident that, considering the requirements of the crop, the fertility of the soil, the new nitrogen and phosphate materials that will be available, that we could introduce a high analysis grade, analyzing something like a 6–8–15, used at the rate of 600 pounds per acre instead of 1,200 pounds per acre, and produce as good or better tobacco. The cost to the farmer would be about 30 percent less than he is now paying, as far as fertilization of tobacco is concerned.

We have analyzed that, carried it through, checked the cost figures with industry, and they are in agreement that that is a possibility that ought to be tested and tried by research.

Senator THYE. Have you gone through the pilot-plant stage?

Dr. PARKER. No, sir; we have not.

Senator THYE. Then this is just——

Dr. PARKER. This is just outlining the problem and the possibilities. It should be put through the pilot-plant stage, enough fertilizer made in the pilot plants to enable it to be thoroughly evaluated on the farm and, when you have that result, then tell industry to go ahead and do it.

Senator THYE. But you say that a certain number of industrial plants that are already under way with this in their own plant activities are doing it and that smaller plants that cannot afford or do not have the facilities would be handicapped and that they could not competitively engage in the development of this program with the large plants.

You propose to do the research for the smaller plants that could not afford it and have not done any of this research to date; is that correct?

Dr. PARKER. Yes, sir. They will be benefited by it.

The larger companies will also be benefited by it because we visualize and have planned, first, laboratory scale work, pilot plant work, and the trials under factory production conditions. When we come to those factory production trials, we will be doing it with the fertilizer industry.

Senator RUSSELL. Who would be the ultimate beneficiary?

Dr. PARKER. The farmer and the man that smokes a cigarette or consumes other agricultural products.

Senator THYE. You say the man that smokes a cigarette?

Dr. PARKER. I say any consumer of agricultural products is going to benefit, whether he smokes tobacco or eats meat. If you can reduce the cost of plant nutrients on the farm by 10 percent—and I am confident we can—the consumer benefits.

### URGENCY OF PROGRAM

Senator CORDON. Is this sudden burgeoning of this particular activity wholly due to the probability that there will be a new and very large source of raw materials made available as a result of the atomic-energy work? Is that the basis for it?

Dr. MOSEMAN. That is the basis for the immediate request, Senator; but it is a problem that has been with us all along in developing higher analysis fertilizers.

Senator CORDON. And you have been doing that, have you not?

Dr. MOSEMAN. We have not been doing the work which is required.

Senator CORDON. TVA has been doing it for better than a decade, have they not?

Dr. MOSEMAN. TVA has not worked on mixed fertilizers, which will be the primary outlet for this material.

Senator CORDON. Nobody has done any work on that; is that right?

Dr. MOSEMAN. The fertilizer companies have been doing some; some of the larger companies have.

Senator CORDON. When did you folks find the urgency of it?

Dr. MOSEMAN. This really ties into the exchange of correspondence about a year ago between the Atomic Energy Commission and the Department.

Senator CORDON. That comes back only to the question of supply of raw materials.

Dr. MOSEMAN. That has really focused the attention on the problem so that we recognize we ought to do something about it right away.

RELATION OF PROJECT TO URANIUM PRODUCTION

Senator CORDON. Is it in effect an attempt to find a useful outlet for what might otherwise be a waste product for primary operation of atomic energy?

Dr. MOSEMAN. No; it would not be a waste product, Senator.

Senator CORDON. It was a waste product until you found some way of handling it; is that it?

Dr. MOSEMAN. You might call it that.

Senator CORDON. Has it other uses as they will have it when they finish with it?

Dr. MOSEMAN. The primary good use for it would be fertilizer.

Senator THYE. If you do not use it as fertilizer, what will happen to it? What would happen to it so far as the atomic energy plant operation is concerned?

Dr. PARKER. I think the Atomic Energy Commission would be inclined to say that uranium is the waste product, or the byproduct. They do not visualize processing phosphate rock to get uranium and throwing the phosphate away. It is more like what they are doing with certain other industries where there is a small amount of uranium that can be removed during the processing operation.

Wherever they can do that, they have gone in and recovered some uranium from a going process, letting the going process carry the cost and then hoping to get uranium out at a reasonable price.

Senator THYE. Then it is not a question that there will be a stockpile or a waste pile from the Atomic Energy Plant which will not be utilized, that there would be excessive cost in disposal or getting rid of it. It is not that question. The first question is: Will the development of fertilizer make available a certain percentage, a small percentage of uranium that could be utilized by the Atomic Energy people and then the other product would go into the fertilizer?

So what you are doing is some pilot work for the Atomic Energy Commission. If you can use the phosphate and there is a litle throw-off of uranium, the uranium would then be made available to the Atomic Energy Commission.

In other words, you are not doing something to utilize a byproduct of the Atomic Energy Commission, but you are just going into a new

field to develop a high-analysis fertilizer, with the hope that there might be a little uranium which would be made available as a byproduct for the Atomic Energy Commission.

Dr. PARKER. The Atomic Energy Commission would get the uranium as a byproduct in the production of a high-analysis phosphate by what is termed the wet process, as contrasted with an electric-furnace process.

It will result in the production of a large tonnage of high-analysis materials, whereas you cannot recover uranium in the production of normal superphosphate.

Senator THYE. The normal superphosphate is from your heat oven; is that correct?

Dr. PARKER. The normal superphosphate is produced by a wet process also, but does not include the features that would enable you to recover uranium. Normal superphosphate contains about 20 percent $P_2O_5$ and in its production you cannot recover uranium.

Triple phosphate contains 46 percent $P_2O_5$ and by the wet process you can recover some uranium.

Senator THYE. It is just expanding the field of where uranium can be obtained and, at the same time, while you are making that, you are advancing and developing a high-analysis fertilizer which will be beneficial to the producer because he can get it at a lower cost.

Senator CORDON. There being no competitive price for uranium and no ceiling on it, you can charge any portion of the overhead cost to the uranium and thereby subsidize the balance of the operation; is that right?

Dr. PARKER. I think there is a competitive price on uranium.

Senator CORDON. Do you know whether in this instance it is planned to recover the uranium at, let us say, a price comparable with the recovery costs in Colorado, or in Canada?

Dr. PARKER. I am not sure. You would have to get that from the Atomic Energy Commission.

Senator CORDON. It has a bearing on what you want this money for, because you are going to have to face a cost factor here.

Dr. PARKER. My impression is that they feel that the additional steps required to recover uranium will give uranium at a moderately reasonable price. They do not plan any subsidy to the producer of the phosphate.

### AIRCRAFT FOR AGRICULTURAL USE

Senator RUSSELL. How about this airplane, Dr. Moseman?

Dr. MOSEMAN. That is the agricultural airplane, Senator. It was developed jointly by the Texas Agricultural and Mechanical College, their engineering experiment station, and their agricultural experiment station, and the Civil Aeronautics Authority.

The Department of Agriculture also has had an interest in it. We had one of our engineers working with the folks at College Station, Tex., to help develop the equipment for that special agricultural airplane. This plane was developed pretty largely through the request of the Flying Farmers Association and other users of agricultural planes for applying insecticides, fungicides, sprays, and dusts of that kind.

This was done with the recognition that the tooled-up small planes that were being used were not satisfactory for the job.

We worked with the Texas Agricultural and Mechanical, and the Civil Aeronautics Authority representatives in developing what we thought would be the minimum requirements for a plane, as far as the distance requirement for take-off is concerned, the speed of flying, landing speed, the location of the spray or dust materials in relation to the pilot's cockpit and several other safety devices that would enable the operator of the plane to have a greater degree of protection from the hazards that he now faces.

The plane has been developed, and this language would enable us to acquire the plane for additional experimental work. We are planning to work with the Forest Service and the Bureau of Entomology and Plant Quarantine to test it and use different types of spray and dust attachments for it.

Senator RUSSELL. Do you expect them to give you that airplane?

Dr. MOSEMAN. Yes. It would be a transfer.

Senator RUSSELL. Those planes are in use for spraying, dusting, and seeding at the present time, are they not?

Dr. MOSEMAN. That is right. They are using planes very widely.

One of the difficulties with the small planes that have been tooled up by individuals is that they are extremely hazardous, particularly some types of planes where they locate a large quantity of spray and dusting material behind the pilot's seat. If he crashes he gets the full impact of that load of material.

Senator RUSSELL. A good deal of this range reseeding has been done by plane?

Dr. MOSEMAN. Yes. It was because of the increasing recognition of the use of airplanes in agriculture that the Flying Farmers group asked us to work with them, and the Texas Agricultural and Mechanical College people on this project.

Senator RUSSELL. Do you expect to operate that plane out of existing appropriations?

Dr. MOSEMAN. We are not asking for any increases in appropriations. We hope to do that out of the funds we have.

### ACCIDENTS IN USE OF AGRICULTURAL PLANES

Senator CORDON. These planes in the Pacific Northwest working in infestation had several fatalities.

Dr. MOSEMAN. I will——

Senator RUSSELL. That, I think, was due to having them out of balance in carrying the spray material.

Dr. MOSEMAN. The design of the plane has been quite a factor.

We were told in Texas last fall that several of the men spraying mesquite in that area had crashed. They must fly fairly low in spraying many agricultural crops and frequently pilots that crash are pinned in their burning plane by the load of spray material.

There have been quite a number of crashes of that kind, pretty serious ones.

So this plane was developed not only to do a good job in meeting agricultural needs for spraying, dusting, and seeding, but also to have all the safety measures on it that could possibly be developed.

Senator CORDON. How about the use of helicopters for those purposes?

Dr. MOSEMAN. They can be used, but they are a much more expensive machine, both to buy and to operate.

Senator RUSSELL. Are there any further questions?

Do you have anything further, Dr. Moseman?

Dr. MOSEMAN. Nothing further.

EXAMPLES OF CURRENT PROGRESS

I just have some examples of current progress that I would like to leave for the record.

Senator RUSSELL. I wish you would leave that for the record and also furnish the other matters requested by the committee.

(The material referred to follows:)

UNITED STATES DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH ADMINISTRATION, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

EXAMPLES OF CURRENT PROGRESS

*Improved cotton varieties.*—The continued emphasis that is being placed on high production goals and the increasing need to reduce costs of production are placing a critical and urgent responsibility on all cotton breeding and improvement research. It is also evident that cotton may be driven out of certain areas unless new and improved varieties are developed.

Improved varieties are being achieved as is clearly demonstrated by the development for irrigated areas of Acala 4–42 which is wilt-tolerant. It is anticipated that the entire cotton acreage of California's San Joaquin Valley (approximately 1¼ million acres) can be planted in 1953 to this improved strain developed by our breeders. In addition, a higher wilt tolerance or true resistance, which is still critically needed for the rain-grown cotton areas, is being developed in selections from several eastern cottons. These recently developed selections will go into field trials in 1953.

The development of cottons with superior fiber properties continues as one of the most promising means of strengthening cotton's competitive position with synthetic fibers. Striking gains in fiber strength and other desirable properties have been derived from interspecific crosses. Their incorporation into lines highly productive throughout the Cotton Belt is nearly within our grasp, and we are pressing forward as rapidly as facilities will permit. For example, one new strain shows 25 percent gain in strength with indications that commercially acceptable lines may be ready for release within 3 or 4 years.

*Good soil management improves mountain meadow forage.*—Soil and fertility studies on mountain meadow forage production at Gunnison, Colo., in cooperation with the Soil Conservation Service and the State agricultural experiment station, showed that yields per acre increased from 1.3 tons to 3.3 tons where best combinations of fertilizers, soil-cultural practices, and water management were used.

This increased production of two tons of hay, currently valued at about $25 per ton, would return a profit of approximately $30 per acre after deducting costs of fertilizer. It is estimated that there are 500,000 acres of such meadow lands in Western States to which these results would be applicable. If ranchers, by adopting these practices, obtain half as good results as were obtained in these experiments, they would receive added income of $7.5 million annually at current market levels. In addition to the tonnage increase, the nutrient quality of the hay has been greatly improved by substitution of improved species in plant stand. Experiments are under way to further determine the feeding value of these improved forages.

*Weed research.*—In each of the past 2 years, American farmers applied chemical weed killers to more than 30 million acres of cropland to control weeds in such crops as corn, wheat, oats, barley, rice, flax, sorghums, pastures, meadows, cotton, peanuts, sugar beets, sugarcane, and many others. It has been estimated that the increased value of agricultural production resulting from chemical weed control averaged at least $5 per acre, or a total of more than $150 million per year.

It was less than 10 years ago that Bureau physiologists discovered that certain growth-regulating chemicals could be used selectively to kill unwanted plants.

As recently as 1945, the use of herbicides in agriculture was highly restricted. Seldom has a new technique in agriculture been adopted so rapidly. The Bureau has put less than $150,000 annually into herbicidal research during the past 5 years. State experiment stations and private industry have invested in herbicidal research, too, but the total cost is exceedingly small in relation to the $150 million annual return.

*Antibiotics in control of plant diseases.*—An important discovery was made which points to the possibility of using antibiotics in the control of plant diseases. It has been demonstrated from work carried on during the past season that when streptomycin sulfate was applied to the stems of bean plants the material was absorbed and carried to the leaves. When bacteria causing certain bacterial diseases are spread on bean plants treated with the antibiotic the plants showed only very slight infection, while untreated plants showed heavy infection. Considerable work needs to be done with various antibiotics to determine their possible value in the control of plant diseases that hitherto have not been controlled with fungicides now available.

*Improvement in fiber-processing machines.*—In the program to develop machinery that will mechanically process fiber plants such as ramie, kenaf, and sansevieria, which have great defense importance, engineers have produced a ribboning machine which can be used in the field, ribboning the fibers as the crop is harvested. The development of a special gripchain has been the key to the success in designing a successful ribboner and an equally successful decorticator.

Fiber flax processing costs can be reduced through the use of a rig developed for unloading fiber flax by the wagonload, rather than by the forkful. The rig will reduce labor and time required to do the job by more than 90 percent, and straw loss and damage by more than 50 percent. A processing plant handling a normal 2,000-ton crop could save $10,000 a year by its use.

*Monogerm sugar beets.*—Varieties whose seed is single germ, instead of multigerm natural to the sugar beet, are now a reality after a search of 50 years. Monogerm seed will eliminate finger-thinning of the clumps of sugar beet plants that come with multigerm seed. The development of monogerm seeds has been essential in the program of fully mechanizing sugar-beet production. Plant breeders are now combining the genetic factor for monogermness with other desirable sugar-beet characters—disease resistance, high yield, and high quality. In 1951, many monogerm curly top resistant types, as well as monogerm leaf spot resistant types, were produced. The possibility of release of monogerm sugar-beet varieties adapted to eastern, midwestern, and western sugar-beet growing districts can now be definitely forecast within the next 2 or 3 years. A most encouraging result in the experiments is the large size of monogerm seed produced by certain plants. This large seed size gives definite indication that the seedlings will be vigorous and the seed itself will be readily usable in precision planting equipment.

*Plant nematodes.*—The decline in production of winter truck crops such as celery, tomatoes, peppers, and sweet corn in the region of Sanford, Fla., has been shown to be due to the attacks of various nematodes feeding on the roots. Soil fumigation for nematode control has resulted in very spectacular yield increases and it is believed that successful winter truck crop production can be reestablished in a number of the Southern States through proper nematode control. The results obtained in Florida should be applicable to other parts of the country where soil-inhabiting nematodes are a problem.

*Handbook of virus diseases of stone fruits.*—Information has been brought together for the first time in illustrated articles contained in a recently published handbook on virus diseases of stone fruits, viruslike diseases, and deficiency diseases that might be confused with those caused by a virus. This publication will be helpful to regulatory officials, nurserymen, and growers, as well as to research workers and students in recognizing these diseases.

*Soil reearch and surveys in the Missouri Basin.*—Soil surveys of proposed irrigation projects in the Missouri Basin covered approximately 400,000 acres in five States in 1951. The information gained will be useful in determining the suitability of the areas for irrigation and the soil problems that will be encountered. For example, the soil survey in the Lake Dakota Basin, Spink County, S. Dak., shows that approximately one-third of the township consists of soils that are suitable for irrigated crops, one-third of soils suitable for pasture, and one-third of soils not suitable for irrigation.

At Mandan, N. Dak., variety tests with corn show that different levels of nitrogen affect the yields of varieties differently. A low-producing variety under low-nitrogen levels may become the highest-producing variety under high-nitro-

gen fertilization. Potato yields were increased by 240 bushels per acre from use of nitrogen fertilizer. In initial studies on the Oahe project in South Dakota, sugar beets yielded 30 tons per acre on a field basis under best practices. These initial studies indicate that certain crops such as corn and sugar beets may have limited adaptation and that crops like alfalfa may not show much response to fertilizer or additional moisture in the first cuttings, but in later or third cuttings will show definite yield increases from fertilization and additional moisture from irrigation.

*Oak wilt.*—Oak wilt has now been found in 16 Midwestern and Eastern States. Surveys to determine the extent of distribution of the disease are being made in cooperation with various States. Since oak wilt produces very noticeable leaf symptoms, the presence of oak wilt can be detected during the summer season by scouting and making observations from low-flying airplanes.

Increased emphasis was placed on research on the development of methods for controlling oak-wilt disease during the past year. Important advances have been made in our knowledge of the cause of the fungus, its host range, and its distribution. Although the perfect spore stage of the fungus has not yet been found in nature, it has been produced in the culture of the fungus in the laboratory. This is an important step in discovering how the disease may be spread over long distances.

*Plant insect and disease control equipment.*—Through the development or adaptation of air-blast mist sprayers, fungicides have been successfully applied to truck crops at considerably lower pressures and in smaller volumes than has heretofore been possible. The use of air-blast mist sprayers to apply fungicides is particularly suited to large field operations because it eliminates the need for long, cumbersome spray booms, high capacity pumps and large quantities of water. Arranging the nozzles on the spray boom of airplanes in an unsymmetrical pattern has been found to improve the uniformity of the spray pattern for insect pest control so that fliers can apply the spray from a higher altitude and thus increase the swath width.

*Helminthosporium leaf spot of corn.*—In 1951, there was much damage to corn in parts of the Corn Belt, especially Illinois, from a leaf spot caused by Helminthosporium. Our scientists had foreseen the threat and had moved as rapidly as facilities permitted toward its solution. Inbred lines have been developed with resistance to the disease. By appropriate breeding methods, that resistance has been incorporated into the inbred lines of U. S. 13 without otherwise changing those lines. Now we are about ready with a new version of U. S. 13 that is resistant to the disease.

*Plants for cortisone.*—During the past year approximately 2,000 collections of miscellaneous plant material have been obtained from various parts of the world for chemical analysis in the search of plant material sufficiently high in chemicals from which the drug cortisone could be obtained. The three most promising plant groups are Strophanthus, Agave, and Dioscorea.

We now have seed of the strain of Strophanthus having the highest yield of the precursors of cortisone thus far reported. This material will be propagated and sent to Coconut Grove, Fla., and Mayagues, P. R., for growing the plants.

A species of yam (*Dioscorea*) is now being sent to us in our cooperative program. It is supposedly better than anything so far discovered and better than the materials used in Mexico which heretofore have been the best. This material will be multiplied and used for experimentation in this country and Puerto Rico, and cooperative trial plantings will be made by farmers in Texas, Alabama, and Georgia.

From the Mexican part of Lower California, species of Agave have been obtained that look very promising, based on yields from plants collected in the wild. If the yields from these preliminary tests can be repeated, arrangements also will be made during this year for agronomic tests with one or two species of this group.

*Hybrid sugar beets.*—Five years of experimentation by the Bureau promise shortly to do for sugar beets what hybrid corn has done for corn. New sugar-beet hybrids are under test that yield 15 to 20 percent more than the standard beet varieties now in use by growers. Sugar-beet hybrids so far have been produced on a small scale. Ways and means need to be discovered for extending the methods to large-scale commercial production.

To produce 100 percent hybrid seed commercially, plant breeders need beet strains which are entirely male sterile, so that all plants of the strain that are devoid of pollen can set seed only if pollinated by another strain. We now have beet strains that are mostly male sterile, but we have not yet attained strains

with 100 percent male sterility. The goal, however, is believed to be near. The work is complicated by the need for combining disease-resistance and the factor for monogermness of seed with the male-sterility factor.

Although 100 percent hybrid beet seed cannot yet be produced on a commercial scale, commercial production attaining 50 percent or more hybrid seed is being used for beet varieties that are resistant to leaf-spot disease.

*Supplying radioactive fertilizers.*—The soil and fertilizer laboratories have utilized facilities developed in cooperation with the Atomic Energy Commission to produce fertilizers containing radioactive isotopes. These fertilizers have been used in field and greenhouse experiments conducted cooperatively by this Bureau and State agricultural experiment stations. Production during the past year amounted to 1,500 pounds of fertilizer containing 335 pounds of $P_2O_5$ (phosphate) and 39 curies of $P^{32}$ (radioactive phosphorus). Thirty-nine experiments in 24 States and Canada made use of these materials. Production of these radioactive fertilizers at a central location has avoided duplication of highly specialized equipment and allowed more effective use of specially trained personnel. It has also encouraged wider use of this new tool in agricultural research. Scientists in the laboratory have also developed a formula and procedure for estimating available nutrients in soils which is a great improvement over previous methods.

*Engineering improvement in cotton ginning.*—More than 4,000 USDA-designed lint cleaners are now in use in commercial cotton gins, processing 3 to 4 million bales of cotton a year. Their use improves cotton one-half grade, on the average.

The pneumatic unloader, with a capacity of 5 tons per hour, requires 90 percent less man-labor to unload or load cotton seed.

The recipro-cleaner is a low-cost cotton cleaner that requires little additional power for its use. It removes three times more weight of motes and leaf trash than do the moting devices in standard gins.

A device to remove green bolls from cotton at the gin can be installed for about $700. It requires no additional power. In use, it removes up to 95 percent of the green bolls, prevents shut-downs, and permits uninterrupted ginning of stripped cotton.

*Stem rust of wheat.*—Race 15B was the most prevalent and widely distributed of all stem rust in 1951. It was found in 19 States, from Mississippi and Texas on the south to the prairie Provinces of Canada on the north and from Colorado and Montana on the west to Virginia on the east. It was extremely prevalent in the summer crop in Mexico where it caused tremendous losses in varieties otherwise resistant to the ordinary races. Race 15B was present in the Southern States in the fall of 1950. Exceptionally low temperatures and one of the driest seasons on record in Texas and northern Mexico, however, destroyed much of the inoculum that otherwise would have blown north to infect the grain fields, and this reduced the losses from race 15B in the north in 1951.

The race is now well-established and is a menace to production until such time as commercially acceptable resistant varieties are developed. Aided by funds transferred within the Bureau and by an appropriation increase of $28,900 for 1952 for this work, a total of approximately 10,000 wheats from the world collection have been tested to biotypes of race 15 at one or more stations in seven Latin-American countries, the Virgin Islands, Canada, and several stations in the United States. Genes for resistance to 15B in bread wheats have been found in varieties from Kenya, Egypt, South Africa, Portugal, and a few hybrid lines of domestic origin and in durum wheats from Portugal, Egypt, Abyssinia, and Palestine. A total of about 300 varieties and selections involving one or more of these genes show promise for resistance to 15B. The best types are being increased at Brawley, Calif., and at the same time utilized as parents in crosses to obtain desirable agronomic types resistant to 15B and the heretofore common races.

Kentana, a variety resistant to 15B developed in the cooperative program in Mexico, was planted on some 40,000 acres in Mexico in the fall of 1951. A small acreage is being grown in southern Texas.

*Wheat streak mosaic.*—This disease has recently become a serious problem in the heart of the hard red-winter-wheat area. With funds diverted to this problem from other projects and with the increased appropriation of $40,000 for this purpose in fiscal year 1952, we are well advanced with a coordinated attack on this problem. We are searching the world collection of 13,000 strains for sources of resistance and have some promising results. We have considerable knowledge, from our virus studies, of the causal agent.

In 1951 wheat-streak-mosaic was prevalent in western Kansas. Losses were less than in 1949 but the area in which the disease was present in the State was considerably extended and caused great anxiety among the farmers. It was present in considerable amounts in western Nebraska and in 1950 was found in spring wheat in northern South Dakota. This virus is neither soil- nor seed-borne and, as yet, no insect has been found to transmit any one of the several strains of the virus in extensive tests in Kansas, Nebraska, and South Dakota. A spray method of inoculation has been devised and in field and greenhouse tests no wheat has been found having a high degree of resistance. Some hybrids between wheat and wild grasses (*Agropyron* spp.) have been found to have a very high degree of resistance to the disease.

A new destructive and distinctly different mosaic virus is now known to be established in South Dakota, Nebraska, and Kansas. It has been determined that this virus is transmitted solely by a leaf-hopper insect.

*Stinking smut in the Pacific Northwest.*—Stinking smut caused very heavy losses to wheat growers in the Pacific Northwest in 1951 when 24.7 percent of inspections of all classes of wheat graded smutty. Greatest losses were in the fall-seeded-club varieties with 52.8 percent of the samples inspected graded smutty. Research is continuing in an attempt to develop (1) high-yielding varieties resistant to the 25 known races of the organism and to dwarf bunt and (2) develop more effective seed treatments. Two new smut-resistant varieties, Brevor and Elmar, were released to growers in 1950. Approximately 5,000 wheats or 40 percent of those in the world collection are being screened this season for sources of resistance to the races of common bunt and extensive tests are under way in the Palouse and intermountain areas to determine new sources of resistance to the destructive soil-borne dwarf-bunt disease.

Senator RUSSELL. The committee will now stand recessed until 10:30 tomorrow morning.

Whereupon, at 1 p. m., Monday, March 24, 1952, the subcommittee recessed, to reconvene at 10:30 a. m., Tuesday, March 25, 1952.)